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CLASSICAL KNOWLEDGE, MODERN REALITY AND QUANTIC SCIENCE

– TOWARDS AN INTERDISCIPLINARY APPROACH IN SCIENTIFIC RESEARCH –

ALINA PREDA

Motto: *"One of the great things about science is its assumption that what it thinks it knows today will probably be proven wrong tomorrow. The theories of yesterday have served as platforms to climb higher, as Sir Isaac Newton meant when he said, "If I have been privileged to see farther than others, it's because I stood on the shoulders of giants." It's only by asking questions, challenging the assumptions and the "truths" taken for granted at any given time, that science progresses. What if that turned out to be true about our personal lives, our individual growth and progress?" (Arntz, Chasse, Vincente & Forem, 2005: 7)*

ABSTRACT. Science, philosophy and literature have evolved in a most impressive way, triggering a similar evolution both in the nature of human ideas and ideals, and in our way of describing them. From a closed space to an open one, from a world centred on man to a world in which man can no longer find his place, we have witnessed and created change. But one thing has not changed and that is the inextricable connection between science and culture. The science of today has neither the limitations, nor the fake unity that characterised the classical view of the world, but, on the other hand, it is no longer tantamount to modern science, which attempted to separate itself completely from other ways of intellectual inquiry, and to present a unified image of reality. Quantum theory now describes a fragmentary, richly diversified universe, full of surprising potentialities. In the field of humanities the situation is very similar: cultural particularities are now perceived as unique and important in themselves, none excluding the others, none being forcefully imposed as the central, fundamental one.

KEY-WORDS: *interdisciplinary, scientific research, philosophical inquiry, quantum theory, time, history, truth, reality, equilibrium, chaos, order*

The very purpose of science, shows Michio Kaku, is “to peel back the layer of the appearance of objects to reveal their underlying nature”, because “if appearance and essence were the same thing, there would be no need for science” (1995: viii). Rudolph Carnap stated, in 1966, that a postulate system in physics “cannot have, as mathematical theories have, a splendid isolation from the world”, but must be “interpreted by correspondence rules”, which are to be seen as an open set, since all throughout the history of physics there was “a steady addition of new correspondence rules and a continual modification in the interpretations of theoretical terms”, although “the basic theories of physics remained unchanged”. While at the very beginnings of scientific endeavour physics was seen mainly as “a descriptive macrophysics, containing an enormous number of empirical laws with no apparent connections”, in time scientists began to search for “underlying, unifying principles”, so as to turn physics from a mere “description of nature” into a “real explanation”. (Carnap, 1966, ch. 23, at www.marxists.org/reference/subject/philosophy/works/ge/carnap.htm)

The search for a coherent outline characterises not only scientific but also philosophical and literary endeavours. In their preface to the second edition of *La nouvelle alliance - Metamorphose de la science* Ilya Prigogine and Isabelle Stengers (1986 [1979]: 8-18), point out that the genesis of the concept of information, the particularities of our biological nature, as well as the notions of structural order are today at the centre of a debate meant to re-new the world of scientific discovery. Time, space, history, truth, reality, fluctuation, irreversibility, chaos, order and equilibrium – these are all widely debated notions, which have been at the centre of scientific research, philosophical inquiry, and literary representation from ancient times until the present day. Science, philosophy and literature have evolved in a most impressive way, triggering a similar evolution both in the nature of human ideas and ideals, and in our way of describing them. From a closed space to an open one, from a world centred on man to a world in which man can no longer find his place, we have witnessed and created change. But one thing has not changed and that is the inextricable connection between human beings and nature, between science and culture. If the theoretical progress in modern science, in molecular biology in particular, caused Jacques Monod to state that “The ancient alliance has been compromised: man finally knows he is alone in the indifferent infinitude of the Universe wherefrom he has emerged only by chance”, Prigogine and Stengers (1986: 30-32) proclaim a new alliance, forged in accordance with the metamorphosis of scientific theory and practice brought about by a new science, whose original practice centres on experimental dialogue, which entails two fundamental dimensions of the relationship between human beings and nature: understanding and causing change. To experiment is thus not only to closely monitor the facts as they appear to be, not merely to search for empirical connections between various phenomena, but to find the interaction of theory and practice, which requires an original strategy. And, just like literature,

science is not a monologue but a dialogue; it is more like a game that involves two participants and requires one (the scientist) to predict the behaviour and reactions of the other (natural phenomena), an entity with a distinct reality. This makes the game a rather risky one, a source of rare but intense feelings and emotions. In the case of the new science, Prigogine and Stengers (1986: 33) argue, success is *a historical fact*, not predictable *a priori*. But it is a state that, once accomplished, is unchallengeable, since its success means that, as part of a given culture, quantum theory managed to discover questions to which nature has responded in a coherent way, thus turning those very questions into a code paradoxically used to decode nature's own processes.

The science of today, show Prigogine and Stengers (1986: 36) has neither the limitations, nor the fake unity that characterised the classical view of the world, but, on the other hand, it is no longer tantamount to modern science, which attempted to separate itself completely from other ways of intellectual inquiry, and to present a unified image of reality. Quantum theory now describes a fragmentary, richly diversified universe, full of surprising potentialities. In the field of humanities the situation is very similar: cultural particularities are now perceived as unique and important in themselves, none excluding the others, none being forcefully imposed as the central, fundamental one(s). Whether they are scientists, philosophers, writers or readers, what modern people are interested in is no longer only the stationary, but the dynamic, not only permanence, but evolution, not only immutable phenomena, but also situations of crisis and instability. In light of the similar evolutions of scientific and cultural endeavours, Prigogine and Stengers (1986: 45-47) argue against the theoretical "extra-territoriality" of science (a term coined by Serge Moscovici), as well as against its cultural "extra-territoriality", stating that it is high time science began to view itself as an integral part of the cultural context in which it has been, and still is, growing and evolving. The opening of the new science towards concepts such as irreversibility and instability was the result of an influence coming from the cultural and ideological context in the midst of which science was developing. Science and culture are both part of a general image of the world, and together contribute to the shaping of this image. Prigogine and Stengers (1986: 48-53) explain this inextricable link by pointing out that the fundamental trait of the real researcher, and of the genuine philosopher, for that matter, is his desire to break free from the misery of everyday life, desire that pushes him beyond the trifles of his personal existence, and towards contemplation and objective knowledge. Thus, he tries to attain a simple and clear image of the world around him. But this is not an easy task in a world drastically changed by ever new generations of more and more advanced machines and techniques. The researcher thus needs a science that can offer him all the conceptual tools he may need to understand the postmodern world. And such a science is neither an instrument subordinated to priorities external to it, nor a foreign entity forged in the midst of a cultural context with which it shares no ties, but a science open to

dialogue both with nature and with a variety of human societies and cultures. Modern science, long equated with "a rationality transcending all ages and all cultures" (1986: 63) which eventually leads to growing disenchantment, leaving the world devoid of all magic, should thus be replaced by a new science, "capable of understanding as well as of describing, partially at least, the complex processes of our everyday life, of our most familiar surroundings, of the natural world we inhabit" (1986: 68).

Prigogine and Stengers's (1986: 38) description of the irrational anti-scientific movements of the 1920s clearly shows that these movements opposed the set of classical notions (causality, legality, determinism, rationality) to themes never approached by classical science (life, destiny, freedom, spontaneity), themes inaccessible by means of reason only, themes that later became highly debated in the world of literature and philosophy, but also in modern science, as soon as it crossed the frontiers previously closed by the classical world view. This is what Prigogine and Stengers (1986: 39) call the metamorphosis of science: the opening up of scientific study to a new theoretical space, to new areas, previously denied or merely ignored. We live, after all, "in a world irreducibly chaotic, in a world where reversibility and determinism are the exception, where irreversibility and vacillation are the rule" (Prigogine and Stengers, 1986: 40). Therefore, scientists should accept that there is no "universally valid law to tell us for certain what the general behaviour of [a] system will be; each system constitutes a unique problem, to be analysed in its singular fashion" (Prigogine and Stengers, 1986: 217), since the homogeneity of time "is doubly destroyed: on the one hand by the active spatial-temporal structure that endows the system with the behaviour of an organised whole, characterised by intrinsic dimensions and rhythms, and, on the other hand, by the very history that led to the apparition of those structures" (Prigogine and Stengers, 1986: 228-229). This is the result of critical points of bifurcation, where a new state of facts becomes possible, where we could say that the system has a "choice", or rather that it makes a "choice", not due to anything like subjective freedom of choice, but due to non-linearity and fluctuation, which may cause even the stability of a stationary state to become unstable. Thus, "it is no longer possible to predict that one particular system will be in one particular state, because there are other states equally accessible to it. The only explanation that remains is therefore a historical, or a genetic one: the way that constitutes the past of the system must be described, the series of bifurcations it has passed through and the fluctuations that contributed to the real historical outcome, out of all the other possible ones". Consequently, it becomes apparent that, in order to describe in a coherent way even the simplest physical-chemical systems, "we have to employ a complexity of notions so far seen as pertaining only to biological, social and cultural phenomena: notions such as history, structure and functional activity, necessary for the description of the order by fluctuation, the order that springs out of a state of non-equilibrium" (Prigogine and Stengers, 1986: 231). Thus, the new

science embraces what modern science had denied "in the name of reversibility: the notions of structure, function and history". Irreversibility is not an illusion, as modern science purports; it is the source of order, able to create and to organise.

Nevertheless, the break with the past, with the classical, is not complete, nor should it be. It is only in the natural order of things for the classic concepts to provide the basis of the new ones, and the evolutionary paths from classical to modern science, and then to quantum theory are inextricably intertwined. Although the basis of modern science were set when scientists decided to abandon the Aristotelian space centred on the organisation and solidarity of biological functions, in favour of the Euclidian space, characterised by homogeneity and isotropy, Prigogine and Stengers's approach (1986: 231-233) to dissipative structures is tantamount to a return to Aristotelian space, given that the above-mentioned structures manifest a surprising coherence of the system as a whole, as "the dissipation of matter and energy, generally associated with loss of efficiency and finally disorder, becomes a source of order: dissipation is at the origin of what we could call the new state of the matter". (1986: 216) According to Prigogine and Stengers (1986: 21-22) the classical law of evolution had as object of study an individual system to which a deterministic description corresponded, whereas the formalism they propose for consideration focuses on a representation of dynamic systems, thus breaking the temporal symmetry of dynamic evolution and allowing for a precise definition of physical irreversibility. This is done by adopting the revolutionary notion of 'instantaneous dynamic state' (Prigogine and Stengers, 1986: 23-25) to replace the notions of trajectory or wave-function. The 'instantaneous state', dynamic by nature, contains in itself a fundamental symmetry towards both the past and the future: its definition embraces in an absolutely symmetrical fashion both the past that gave rise to it, and the future towards which it is directed. This dynamic state marked by the flow of time seizes the moment as the memory of the past, but also contains the virtual reality of an open future.

On all levels, it is science that re-discovers time, and it is time that will eventually allow us to design a new type of unified scientific knowledge. Fluctuation and intelligibility, determinism and chaos are not in opposition any more; they form together a frame that no longer sees the distinction between macroscopy and microscopy as a given fact, but as a problem to be solved. While at the beginning of the 20th century scientists viewed time as the enemy, and consequently tried to deny the diversity of time processes, in their search for the ultimate scientific discovery – a grand unified image of the physical world, we are now at a point where time is seen as the guiding string in an exploratory endeavour that allows scientists to explain without denying and that permits articulation without unwarranted reduction. This re-discovery and re-valuation of time by scientific fields such as physics and chemistry draws attention upon the fact that the history of science is anything but a calm accumulation of facts that fit in a unanimously accepted frame. It is, in fact, a history of dilemmatic choices, full of

unexpected definitions, discoveries and transformations of meaning. Time is now viewed as a productive, though irreversible, force shaping the complex, multi-layered life we are leading today. Natural sciences have thus been liberated, both at a microscopic and at a macroscopic level, from the 'straight and narrow' view on objective reality, a view that was "forced to deny its principles all novelty and diversity in the name of an immutable universal law" (Prigogine and Stengers, 1986: 364). They are now open to dialogue, ready to communicate with nature, a nature that cannot be dominated with the help of a single theoretical corpus, but which can only be explored, throughout its permanent renewal and constant changes (Prigogine and Stengers, 1986: 364). The history of negativist science was also the history of social and cultural tensions. But nowadays, contemporary science embraces the notion of irreversible time, admits that "each complex individual consists of a plurality of times", connected to one another in a network of subtle links. And history, be it that of one being, or of an entire society, can no longer be "reduced to the monotonous simplicity of a unique invariant time (Prigogine and Stengers, 1986: 366-367).

Upon careful consideration of the effect that the discovery of each of the four fundamental forces (gravity, electromagnetism, strong and weak nuclear forces) has had in the history of human civilisation, we realise how closely linked scientific discovery and socio-cultural development are:

> "For example, when Isaac Newton wrote down the classical laws of gravity, he developed the theory of mechanics, which gave us the laws governing machines. This, in turn, greatly accelerated the Industrial Revolution, which unleashed political forces that eventually overthrew the feudal dynasties of Europe. In the mid-1860s, when James Clerk Maxwell wrote down the fundamental laws of the electromagnetic force, he ushered in the Electric Age, which gave us the dynamo, radio, television, radar, household appliances, the telephone, microwaves, consumer electronics, the electronic computer, lasers, and many other electronic marvels. Without the understanding and utilization of the electromagnetic force, civilization would have stagnated, frozen in a time before the discovery of the light bulb and the electric motor. In the mid-1940s, when the nuclear force was harnessed, the world was again turned upside down with the development of the atomic and hydrogen bombs, the most destructive weapons on the planet." (Kaku, 1995: xi)

Prigogine and Stengers's give careful consideration to "the communication between physics and chemistry on the one hand, and the sciences pertaining to human beings, cultures and societies, on the other" (1986: 255). This kind of communication goes way back to the first studies of equilibrium states, then of mechanics and, finally, of thermodynamics. Prigogine and Stengers (1986: 41) themselves seem to be aware that "the issues that leave their mark on a certain culture may have considerable influence on the development of scientific theories".

One such issue, and probably the most important from this point of view, is *time* – a cultural problem of which Bergson wrote: "If time is not an invention, it is nothing at all" (www.whatthebleep.com/reality). It is indeed a cultural problem, as it is now clear that ever since the first theories of mechanics through Einstein's theory of relativity, and then up to quantum mechanics, time and space have been so closely linked that they were, more often than not, mixed up. Prigogine and Stengers (1986: 25-27) show that Aristotle's definition of time as the measure of movement in respect of the before and after left open the question of perspective: should the perspective be of the one who does the measuring or of that which is being measured? Scientists chose the former alternative and thus physics today has to fight to break free from the vicious circle of ***full cause – entire effect***, to do away with the idea of the omniscient God of classical rationality, to accept that while no science or scientist may clearly answer Augustin's question: "What is time?", any attempt to do so should be grounded on the concept of a process, of a selective memory of the past, enriched with the potentiality of an open future. This is the only way to restore to this scientific question the philosophical dimension that clearly belongs to it. And today, show Prigogine and Stengers (1986: 41-44) we witness a long-awaited "rediscovery of physical time" and of irreversible processes, for the second law of thermodynamics finally took into account the distinction between the future and the past when it came to physical descriptions, so "it was thermodynamics that first introduced "the arrow of time" into the science of physics". And since, as Whitehead (quoted in Prigogine and Stengers, 1986: 269) argued, "A clash of doctrines is not a disaster, it is an opportunity", the development of thermodynamics with its study of irreversible processes was then completed by the discovery, in molecular biology, that, in contrast to the inorganic world, in the case of living organisms non-linear reactions are the rule, not the exception: "In fact, the fundamental mechanism through which molecular biology explains the transmission and use of genetic information is itself non-linear – DNA – a spiral containing in sequential form the information required for the synthesis of different proteins essential for the architecture of the cells" (1986: 219). And thus, thermodynamics encounters molecular biology.

In their attempt to reach a more profound understanding of the natural world, both scientists and philosophers have had to face an obsessive theme: the relationship between being and becoming, between permanence and change. (1986: 353) The example of Michele Besso, Einstein's closest friend, is telling of the close connection between all fields concerned with the significance of human existence: Besso, although a scientist, became increasingly involved, towards the end of his life, in an intense study of philosophy and literature, and kept pestering Einstein with questions about randomness and irreversibility. Einstein's reply was that irreversibility is but an illusion, the result of improbable initial conditions, and that, "for those who are physicists to-the-bone, the distinction between past, present and future is only an illusion, although a pretty powerful one" (1986: 366). Today's

physics, however, show Prigogine and Stengers (1986: 366), has finally ceased to deny and ignore time. Time is, nowadays, acknowledged, seen as the irreversible flow of evolution towards a state of equilibrium: "Each complex being consists of a plurality of times, branched one on the other, through multiple and subtle nodes. History, be it the history of a living organism, or of an entire society, can no longer be reduced to the monotonous simplicity of a unique time line, whether static and invariant, or moving towards progression or degradation" (Prigogine and Stengers, 1986: 366). The discovery of the complex nature of time is by no means "a 'revelation' that has suddenly emerged in science, on the contrary, "scientists have now ceased to deny what, in fact, everybody knew" (Prigogine and Stengers, 1986: 367). It was this very denial that had made the history of the time-negativist science be a history of social and cultural tensions as well. What had started as "a daring bet against the dominant Aristotelian tradition" progressively became "a dogmatic assertion" directed against all those physicists, biologists, chemists, and physicians who were trying to "respect the qualitative diversity of the natural world". (Prigogine and Stengers, 1986: 367) And, at the end of the 19th century, given that the sciences had already divided into clearly distinguished branches, the confrontation involved Science, on the one hand, and the "cultural domains", especially Philosophy, on the other hand. This battle is now coming to an end, since philosophy can help theoretical physics answer some of its thorny questions (Prigogine and Stengers, 1986: 374), and thus sciences, even those labelled as "exact sciences", have realised how important it is to resist the temptation of embarking on an idyllic quest for universal truth, and to reassert their status of "natural sciences", or "human sciences", created and studied by human beings, for the benefit of their fellow human beings (Prigogine and Stengers, 1986: 372-373). Physics and metaphysics have finally met in an attempt to describe a natural world where "processes and changes are part and parcel of physical reality", and thus their interaction, their birth and their death can finally be accounted for (Prigogine and Stengers, 1986: 377). The internal dynamics of the evolution of science is reassessed by Prigogine and Stengers (1986: 380), who point out that the biological pattern of evolution should be replaced by the geological one, as the latter is much more appropriate for the way in which science progresses: not in a unidirectional, irreversible way, particular to each and every separate scientific branch, but in a rather convergent interdisciplinary manner, by reassessment, revaluation and renewal of ancient and classical questions and answers. Scientific evolution, as a process, resembles, therefore, a series not of mutations, but of sliding moves, so the geological image is more suitable than the biological one: "The history of science is not characterised by the simplicity usually attributed to the biological evolution towards specialisation, but is a much more subtle history, more twisted and surprising. It is always likely to revert to a previous theory, to rediscover forgotten questions in the middle of a transformed intellectual landscape, to untie the knots it had previously strengthened, to overcome the most deeply rooted prejudice, even if

that particular prejudice may seem to be one of its constitutive elements" (Prigogine and Stengers, 1986: 381). Just like social history, the history of science is a complex process, which "involves the coexistence of events determined by local interactions and projects informed by global perspectives on scientific attempts and on the ambition of knowing more. It is also a dramatic story of ambitions unfulfilled, of ideas that failed, of accomplishments whose desired signification was distorted" (Prigogine and Stengers, 1986: 384). The so-called "scientific crises" were nothing more than changes of paradigm, only that scientists – instead of exclaiming, like Niels Bohr, "How wonderful that we have met with a paradox. Now we have some hope of making progress" – were reluctant to change. They had not realised, as Niels Bohr did, that although "[t]he opposite of a fact is falsehood, […] the opposite of one profound truth may very well be another profound truth" (www.whatthebleep.com/reality). The clash between science and philosophy was mainly due to the fact that philosophers, instead of accepting the established paradigm as "a silent, almost invisible norm, of the 'it goes without saying' type", asked questions and provided answers that challenged the existent paradigms, thus causing "the crises" that finally forced the scientists to unwillingly accept a change of paradigm (Prigogine and Stengers, 1986: 382-384). Prigogine and Stengers (1986: 385) argue for a science characterised by openness, a science that embraces fruitful cooperation with other, complementary, fields of inquiry, such as philosophy, instead of ignoring or contesting them.

Another essential issue is the concept of equilibrium, whose intellectual load has its origin not in mathematics, physics or chemistry, but in an array of other fields in social sciences, wherefrom the idea of harmony sprang. Moreover, this communication has always been reciprocal, as, for instance, "the notions of crisis and instability that accompanied the discovery of dissipative structures resonated with areas of contemporary culture, where such concepts aroused a keen interest" (1986: 256). Both sciences and social sciences employed notions such as wave propagation (see Saussure's *Cours de linguistique generale*) or dynamics (see Levi-Strauss's analysis of the dynamics of the Western world in its relations with other cultures). The process of industrialisation, show Prigogine and Stengers (1986: 257), was especially seen as a self-accelerating process, similar to chain-reactions, which created internal differences (ruptures in symmetry), like a process open to other systems, which had been feeding some of its own circuits, and have irreversibly modified it. The idea of 'order by fluctuation' draws attention not to the opposition, but to the interplay between hazard and necessity, between challenging innovation and the reaction of the system, between the functional and the dysfunctional. Thus, all norms are seen as the result of a choice, but bound to be influenced by hazard at one point or another (Prigogine and Stengers, 1986: 260). Irreversible processes play a constructive role, "the processes characteristic of our own life, of our active and complex nature, are only possible because they are maintained far from a state of equilibrium, by the incessant flux nourishing

them" (Prigogine and Stengers, 1986: 265). Quantum mechanics brought new light to the study of dynamics, since quantum phenomena presuppose the existence of irreversibility (Prigogine and Stengers, 1986: 318). It was thus shown that, due to the coexistence of reversibility and irreversibility, the classical idealised image of a dynamic world seen as isolated and predictable was an inaccurate one (Prigogine and Stengers, 1986: 320). The thermodynamics of irreversible processes showed that the flux that causes certain physical – chemical systems to enter a state of non-equilibrium can "nourish spontaneous phenomena of self-organisation", can do away with symmetry, thus leading to an evolution towards "stages of increasing diversity and complexity" (Prigogine and Stengers, 1986: 360). Consequently, we have finally reached the state of awareness that for Aristotle had been clear all along; we now know and accept that nature's ways are impossible to predict, that accidents happen, and cannot always be avoided, that small differences, insignificant fluctuations, can and will, if they occur in convenient circumstances, invade all the system, and generate a new operation (Prigogine and Stengers, 1986: 361) Moreover, this intrinsic instability is to be found not only at the macroscopic level, but at the microscopic one as well. Quantum mechanics and quantum dynamics have pointed out the impossibility to predict the trajectory of a complex dynamic system, thus proving how inaccurate deterministic theories are, and how invalid the idea of an omniscient scientist is (1986: 363).

The question of how much scientists can learn about the world and share with the general public is central to the movie *What The Bleep Do We Know?*. A mix between a film and a documentary, which makes use not only of refined visual effects, but of lively animation as well, *What The Bleep Do We Know?* comprises enlightening interviews with sixteen of the world's top researchers: neurologists, anaesthesiologists and physicians (Stuart Hameroff M.D., Dr. Jeffrey Satinover, Andrew B. Newberg, M.D., Dr. Daniel Monti, Dr. Joseph Dispenza), physicists (William Tiller, Ph.D., Amit Goswami, Ph.D., John Hagelin, Ph.D., Fred Alan Wolf, Ph.D., Dr. David Albert), biologists (Dr. Candace Pert), mystics (Ramtha, Miceal Ledwith, Ph.D.), who talk about physics, cells, biology, atoms, nuclei, emotion, addiction, truth, consciousness, exploring the nature of reality, psi research, controlling the environment by way of "intention" and "spiritual" training. "[T]his amazing award-winning film is a radical departure from convention. It demands a freedom of view and greatness of thought so far unknown, indeed, not even dreamed of since Copernicus." (Grand Jury Documentary, Washington DC Independent Film Festival March 11, 2004 – see www.whatthebleep.com/awards). Marlee Matlin, probably "the world's most renowned deaf person" (*Business Week*, 2001), plays Amanda, the protagonist of the movie, who "finds herself in a fantastic Alice in Wonderland experience when her daily, uninspired life literally begins to unravel, revealing the uncertain world of the quantum field hidden behind what we consider to be our normal, waking reality" (www.whatthebleep.com/synopsis). Matlin, who stated "I like to say that

the greatest handicap of deafness does not lie in the ear, it lies in the mind", by performing in this film helps "suggest the question: 'What slices of reality are WE deaf to?' " (www.whatthebleep.com/faq) .

The film points to the questions tormenting the post-modern self – "Who am I? Where do I come from?" "Why am I here?" "Where am I going?" "What am I to do?" – questions that classical science was not able to answer, since mechanism is not the solution, and neither was modern science, at least not until Quantum Theory came into being. The more we look at the world, the more mysterious it becomes, and Quantum Physics is the most appropriate key to solving the mystery just because it does not wish to end it. The mystery cannot simply be explained away. Quantum Physics is like the Sphinx, the Oracle, who offered answers as questions, as riddles, each answer sending the recipient on a new journey towards a new question, and another answer after that, over and over again. But this is not in vain: by asking all those meaningful questions, we open new doors and can gain access to new ways of perceiving the world, of being in the world. As Fred Alan Wolf, Ph.D. states (in Arntz, Chasse, Vincente & Forem, 2005: 1), "[a]sking yourself these deeper questions […] brings a breath of fresh air. It makes life more joyful. The real trick to life is not to be in the known, but to be in the mystery." Quantum Physics urges us to assume responsibility, and to try to discover for ourselves what reality is. According to Amit Goswami, Ph.D., (on DVD, 2004: 27'), Quantum Physics is a study of possibilities, in which we can engage only when we realize that the first step towards knowledge of the outer world is breaking with the patterns of misconceptions and preconceptions about the world we inhabit, and with the so-called "truth" we have just been taking for granted. We are so deeply anchored in the routine of our daily existence, that we have become blind to the infinite ocean of potentialities surrounding us. We have been conditioned to believe that we are just powerless subjects, objectified by the paradigms of a reality we have absolutely no control over. Therefore, as Dr. Joseph Dispenza (on DVD, 2004: 06'; 08') notices, we do the same things everyday, we enter the same types of relationships, and we are sadly unaware of all the options and potentials awaiting us. We are in a vicious circle, and we do not even realise it. We keep recreating the same realities, thinking that we have no control at all, when, in fact, the outer reality creates us only to the very same extent that **we** create **it**. Quantum Physics clearly shows that the very root of what happens outside us is what happens within us: "There are physical realities that have the potential to become rock-solid realities, but that come into existence only by contact with some other item of physical reality – the human being, for instance." (Dr. Jeffrey Satinover, on DVD, 2004: 07'- 08'). We help create the reality we live in. And this statement is not metaphorical. Scientific experiments, shows Dispenza (on DVD, 2004: 09'- 10'; 15'- 16'), have proven that, since the same neuronal response occurs at a person's seeing an object and at the same person's **imagining the object**, eyes shut, or **remembering it**, the brain does not differentiate between

what we "**see**" in the environment and what we **remember** or **imagine**. The brain's reaction is the same when we see something with our own eyes, and when we imagine or remember that thing. We are constantly overwhelmed by information nowadays, and although the brain is bombarded with 4 billion bits of information per second, only 2,000 of these are processed, especially those pertaining to our body, the surrounding environment, and to time (Dr. Candace Pert, on DVD, 2004: 10'- 11'). If those 4 billion bits of information a second are a glimpse of reality, but many of them are discarded, as "less relevant", then what we perceive at the level of consciousness is only "the classical tip of an immense quantum-mechanical iceberg" (Dispenza, on DVD, 2004: 10'). Our eyes are like a lens: they let through more than reaches consciousness, but it is the visual cortex that actually "does the seeing" – it is there that the "tape" is recorded. "The brain imprints what it has the ability to consciously project of what we are able to see with our eyes" (Ramtha, on DVD, 2004: 11'- 12). Our eyes seem able to see more than the brain can process, and this leads us to the question of whether the way reality feels to us is really the way reality is. **What is reality? And is reality the same for everyone?** Before even attempting to answer these questions, let us first recall Wittgenstein's query into the nature and manifestation of pain, and his beetle-box thought experiment, in which all those taking part in the experiment hold a box in which they have what they call "a beetle". However, each and every person can see only the "beetle" in his own box, not the other ones, so it seems "quite possible for everyone to have something different in the box" (2001 [1953]): 293). Similarly, our perception of reality is "private", in that we, as the subjects of experience, are the only ones having access to it. The world around us is the box we peer into, and what we call reality is the beetle – the bits of information that are processed by our brain. Thus, it is possible that the ability to perceive reality differs from individual to individual.

But because it is difficult for us to believe there are other ways in which the world may be, we are unaware of the influence we exert on reality, and the effects of reality that we create are not as powerful as they could be, because in order to affect reality ever more significantly we must believe that we are able to do it. Although it is extremely challenging for us to imagine our individual experiential lives as being fundamentally and qualitatively different than the way we perceive them to be, "there actually are choices in the direction of how a life can go, that are contingent upon small-level quantum effects not being washed out" (Dispenza, on DVD, 2004: 16'- 17'). There are always webs of possibilities, until the moment when we make a choice; then, one becomes active, and we have affected the reality of the world we live in. Our input is thus essential in determining the state of the world. Reality is possibility of mind; it is possibility of consciousness. However, due to our conditioning, we "perceive" only what we believe to be possible, because we first match whatever we see with patterns we are familiar with by way of conditioning (Dr. Candace Pert, on DVD, 2004: 12'). Consequently, since everything that goes on 'out there' is utterly dependent on

what goes on within ourselves, we are still unable to give a clear-cut answer to the great philosophical question of what science can say about our world, as long as the scientists are always the observers, and thus always constrained by what their brain "ultimately allows [them] to really see" (Andrew B. Newberg, M.D., on DVD, 2004: 14'- 15').

The conceptual metamorphosis of science is not tantamount to rupture (Prigogine and Stengers, 1986: 390); on the contrary, it restores physics to its natural realm, as it brings scientists closer to the idea of autonomous transformation the Greeks called *physis*. Human activity has brought about "a new state of nature", populated not only by humans, but by machines and technological gadgets, which must be evaluated by taking into consideration a framework different from the rigid, classical one. The new framework should include the socio-cultural factors relevant to the "new state of nature", establish communication with other areas of scientific and intellectual endeavour, and abandon the excess of technicality in favour of a humanistic touch (Prigogine and Stengers, 1986: 390-391). The recent scientific revolution was brought forth by a metamorphosis of the world we inhabit, and its implications are that our world can no longer be described and explained with undeniable certitude, the way the ancients did, that "whether we refer to music, painting, literature, or mores, no model can claim unique legitimacy, or exclusivity. Everywhere we look we see multiple experimentation, more or less risky, short-lived or successful" (Prigogine and Stengers, 1986: 391) and realise that our world, born under the sign of the chaotic, governed by radical insecurity, is "a product of the circumstances and at the mercy of circumstance" (Prigogine and Stengers, 1986: 392). The world can no longer be seen as "a finished product, stable and harmonious, made especially for us" (Prigogine and Stengers, 1986: 392), the way the ancient people saw it, and neither can it be viewed as the "silent monotonous mechanism over which we have no control" (Prigogine and Stengers, 1986: 392), as the modern scientists perceived it. All bias must be set aside, because, as William James pointed out, "there is no source of deception in the investigation of nature which can compare with a fixed belief that certain kinds of phenomena are impossible"
(www.whatthebleep.com/reality). Both the classical alliance and the modern one have expired. It is high time we realised that, although we are part of this world, it was not created for us, and it is time we accepted that in order to blend in and to discover the key to understanding nature's mysteries we must respect nature, and approach it respectfully, with the tools of insight, imagination and intuition (Prigogine and Stengers, 1986: 393). These tools are to be used because, as Ken Wilber stated, "men and women have available to them a spectrum of knowing – a spectrum that includes, at the very least, the eye of the flesh, the eye of the mind, and the eye of the spirit" (www.whatthebleep.com/reality). Einstein himself stated that "The gift of fantasy has meant more to me than my talent for absorbing knowledge" (www.whatthebleep.com/reality). Thus, when we have discovered, as

William James did, not only that "[a] great many people think they are thinking, when they are merely re-arranging prejudices", but also that "a human being can alter his life by altering his attitudes of mind" (www.whatthebleep.com/reality), we shall forge "a new alliance" (Prigogine and Stengers, 1986: 393), where historical, sociological, cultural and scientific endeavours mutually support each other in their respective interdisciplinary complementary approaches to the exploration of nature. "Within a rich and various population of cognitive practices, our scientist occupies the unique position of a poetic listener to nature", a poetic witness of the natural world, poetic in the etymological sense of the word. Thus, the scientist is meant to be a manufacturer, "to actively explore nature, in a manipulative and calculated way", but to manifest a deep respect towards nature – his subject of choice (Prigogine and Stengers, 1986: 374). If scientists fail to do that, then, as Georg Lichtenberg stated, "[p]erhaps in time the so-called Dark Ages will be thought of as including our own" (www.whatthebleep.com/reality).

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STUDENTS' PERCEPTIONS AND REPRESENTATIONS ON CIVILIZATION AS THEY ARE REFLECTED IN THEIR POSTERS

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RÉSUMÉ. L'objet de cette étude est représenté par trois posters réalisés par des équipes formées par quatre élèves de la VII [e] classe de l'Ecole Générale No. 1 de Bistrita. Les élèves ont réalisé les posters pendant le cours optionnel pluridisciplinaire « Les problèmes fondamentaux du monde contemporaine » de l'aire de l'enseignement Homme et société. Les posters ayant le thème « L'absence de la civilisation » ont été réalisés dans un atelier, ayant une durée de trois heures, dans la présence du professeur, après une documentation de deux semaines. Les élèves y ont abordé les suivantes sous-thèmes proposés par le professeur: la définition de la civilisation, les causes de l'absence de la civilisation (Pourquoi y-a-t-il pas de la civilisation ?), les problèmes causés par l'absence de celle-ci, des mesures ou solutions pour résoudre le problème de l'absence de la civilisation, des conclusions. Les élèves ont élaboré des sigles, ont crée des slogans et des quintets adéquates à ce sujet.

The Context of the Experiment

The object of this study is three posters realised by at random formed teams. Each team had four students of the 7th grade from Şcoala Generală no. 1 in Bistrița. The students elaborated the posters during the optional multidisciplinary course *"Fundamental Problems of the Contemporary World"* of the *Man and Society* curriculum area. In the last years, the students learnt to work in teams, do a research, select and graphically organize pieces of information and images about a certain theme, create sigla and quintets. The posters were realised during a three hour-long workshop where the teacher was present and after a period of two weeks for documentation from a recommended and non-compulsory bibliography.

When communicating the task to the students, they received information about the theme and the structure of the poster, and about the criteria for poster evaluation. For the subject *"Lack of Civilization"* the students approached the following sub-themes that the teacher proposed: the definition of "civilisation", the causes of the lack of civilisation (Why there is no civilisation?), the problems

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caused by the lack of civilisation, measures and solutions for solving the issue of the lack of civilisation, and conclusions. The students had to elaborate sigla, and create adequate slogans and quintets on this subject. Each team was free to put on the poster the wanted content elements (e.g. a dictionary, a description of the phenomenon in the local horizon etc.).

The poster presentation and assessment took two hours. When elaborating, presenting and assessing their posters, the students took into account the following criteria: "1) *Correctness of the content* (there should be no mistakes);

2) *Complexity of the content* (the complexity of the approached sub-themes and ideas);

3) *Creativity* (poster conception, modality of combining text with illustrations, originality of ideas, of the sigla, of the slogan, of the quintet, of the conclusions, and of the approached issues, expressiveness of the text, original solutions etc.) (it is special, it amazes me, it enchants, it is very interesting);

4) *Aesthetics* (structure, modality displaying colour, lines, and forms, clarity) (beautiful, clear, good, attractive, schematized);

5) *Teamwork* (good collaboration and communication between the members of the team, each one brought his or her contribution, capacity of listening to each other and of appreciating the other's work, capacity of completing each other);

6) *Oral presentation of the poster* (clear, fluent, firm, convincing, logically supported presentation, each member of the team takes part in the presentation);

7) *Self-assessment* related to teamwork, to personal contribution, and to poster (objectivity, sincerity, and correlation to the established criteria);

8) O*ther colleagues' analysis of the products*: positive aspects (they should give arguments), negative aspects (they should give arguments);

9) *Assessment of the colleagues' posters and activity* (team work, documentation: how much?, what?, how?)".

Motivation in Choosing the Theme of the Poster

During this optional course, we approached several themes*: Pollution, Poverty, Drugs and AIDS, Environmental Protection, Natural Resources* etc. While elaborating the poster with the theme *"Lack of Civilisation"*, the students had to achieve the following objectives:

a) *cognitive operational objectives*:

- to define the concept of "civilisation" using the dictionaries;

-to identify the civilised/uncivilised individual's features, the features of the civilised/uncivilised environment;

- to deduce the necessary measures and solutions in order to form a civilised individual and to create a civilised environment;

b) *methodological operational objectives*

- to extract ideas from diverse sources (books, magazines, Internet etc.);

- to identify the environment where lack of civilisation is obvious;

- to identify evidence in support of a hypothesis;

- to formulate arguments in support of a hypothesis;
- to elaborate a sigla and a quintet;
- to organise information and illustrations on a poster;

c) *attitudinal operational objectives*

- to express in a slogan his or her attitude towards a civilised/uncivilised individual and towards a civilised/uncivilised environment;
- to make a list of the civilised/uncivilised individual's values;
- to co-operate with the team colleagues.

During the optional course, we wished that the students acquired and developed many competences: to work in a team, to do a research, to elaborate a poster, to present orally one of the team's products, to assess himself or herself and to assess the process of poster elaboration according to his or her observation and use of the interview method, to assess himself or herself and to assess his/her poster, and his/her presentation according to the teacher's proposed criteria.

Analysis and Interpretation of the Students' Posters

The three posters were different in structure, content, conception, the overall representation etc. Poster no. 1 had the following elements: "Causes" (of the lack of civilisation), "People are civilised if:", "Situation of Romania", "Situation of Bistrița-Năsăud", "Human values", "Spiritual accumulations", "Measures", "Conclusions", "Sigla", "Haiku", "Dictionary", the members of the team. Poster no. 2 had the definition of "civilisation", "Civilised population", "Problems related to lack of civilisation", "Civilised country", "Why there is no civilisation?", "Solutions", "How does non-civilisation affect us?", a slogan, two sigla, a quintet, the members of the team. Poster no. 3 had the definition of the civilised man in "What does it mean to be civilised?", "What are the problems created by the lack of civilisation?", "Solution", a poem, two slogans, a drawing, a haiku, the members of the team.

1) Conceptualisation. Civilisation (fr. *civilisation*) represents the level of material and spiritual development of the society, of a people, of a state in a certain epoch, etc. Civilisation is associated to the concept of "culture" (either material or spiritual) (DEX, 1998). Civilisation represents a people's or a society's highly developed material culture, etc. (*Dicționarul de neologisme*). Civilisation is an antonym of barbarian society and wildness/savagery (Seche, Seche, 2002).

To define civilisation, the students used *Dicționarul explicativ al limbii române* (1998) and adapted the definitions according to their understanding capacity of the concepts and in order to accomplish the tasks of the theme. Team (1)[4] defined civilisation as "a form of politeness that differs from one country to another, from one epoch to another according to the social environment and to the circumstances!", and in the poster's *Dictionary* they completed "civilisation – high development characterising a society" without quoting the definition from the DEX

[4] The number of the team.

(1998). The team members perceived a gentleman as "a mannered man that tries not to upset anyone and makes the ones around him feel good" and they placed him inside the "civilised world". Team (2) considered civilisation "a material and spiritual development level of the society, of a people, or of a state". Team (3) did not define civilisation – a concept with a high degree of abstractness and generalisation – but operated at a concrete level where they identified "the civilised individual whose culture and technique is developed, and who has arrived at a superior degree of civilisation. High living standard". During conceptualisation, the 13-14 year old students operated more at the concrete level than at the abstract one. They selected the information taken from the dictionaries according to their representations of the respective concept and not according to logic criteria. They did not quote the used bibliography.

Team (1) narrowed the content of the concept of "civilisation" to the people's features (attitude, behaviour, vice, habits). The students had the following perceptions and representations: "**People are civilised if they:** are informed, protect nature, are mannered, are discrete, take care of their heath and hygiene, communicate correctly, respect the age of a person, promote non-violence, behave correctly in the public space, eat correctly/healthy, give help, do not gossip, respect loisir, respect the other's opinion, arrive on time, respect the other's values, dress correctly, are tolerant, and live peacefully with the others." The members of team (1) did not differentiate between the causes of the lack of civilisation and its forms of manifestation. They considered these forms to be **causes** as well: lack of education, lack of information, inculture, laziness, irresponsibility, the habit of lying, stealing, copying, vulgarity; people that do not protect nature, unmannered people; bad habits; bad family; no respect for hygiene; no respect for old age; promotion of violence; eat and comment during shows; do not give any help; gossip; incorrect loisir; do not respect other's opinion; arrive late; ungrateful; dress incorrectly; intolerant". So that the students identify the causes of the lack of civilisation, during the poster presentation, the teacher asked the following question: "Which are in your opinion the causes of the lack of civilisation?". From their own list, the students identified the following causes: lack of education, lack of information, inculture, laziness, and irresponsibility.

Team (2) studied the civilisation phenomenon for a large space and for a large human community. They enumerated the following attributes of the **civilised people**: "they have a correct attitude towards nature, keeping it clean; they communicate correctly and mannerly with other people; they are highly educated, they are well informed; they live peacefully with their neighbours, helping them when they need it; they observe the rules and the law, they are responsible; they are serious; they work correctly; they respect values, they respect the public property; they do not waste anything; they take care of their health; they respect their work hours; they are polite; they have a correct loisir programme; they do sports." The members of this team had the following representations about a "**civilised country**:

people are civilised; people promote recycling; clean and secure transport means, streets, and buildings; lack of beggars".

Team (3) studied the people according to the civilised individual's portrait. They asked themselves: "**What does it mean to be civilised?**" In order to answer this question, the students did judgements of value about themselves and about the others: "to know good manners and to prove that you know them; to be an active person in the society; to be kind, respectful, and help the others; to respect the others' work; to be modern (to know and apply the latest scientific discoveries); to keep the pace with the needs of the society; to keep your word; to know how to manage your time; to be a positive thinking person; to be a pleasing, communicative, and hard-working person; to enlarge your educational level continuously; to get involved in the training and education of those around you; to be a tidy person; to be a clean person; to be a styled person; to be a refined person when approaching different issues of living, due to the inventiveness and correctness involved in those approaches; to be a good example for those around you; to reach permanently for perfection; to love and to be loved; to have a large and adequate group of friends." In the end, each member of the team could use that list as a self-evaluation model and was able to decide his or her degree of civilisation comparing it to that of his or her colleagues.

2) Identifying the Problem. During the optional course, "Lack of Civilization" was considered one of the contemporary world problems. After clarifying the concept of "civilisation", the students were asked to discover the reasons for which lack of civilisation was an issue for any country, no matter its degree of civilisation. The students identified the following **problems related to the lack of civilisation**: "pollution, dirtiness, unpleasant smells; indifference, unmannered behaviour; inculture, kitsch promotion; imposing wrong ideas, erroneous perceptions; egotistical actions; chaos, anarchy, deeds without an author; destruction of public property; disease" (2); "society develops slowly; low living standards; alcoholism; drug dependency; terrorist acts; family violence; inculture (illiteracy); disease => AIDS; human trafficking; delinquency; popular revolts; underdevelopment; job scarcity or lack of jobs; poor population; subnutrition/ malnutrition; famine; infantile mortality" (3).

Such representations of the students should constitute a challenge for the educators because the students identify among the problems caused by the lack of civilisation alcoholism, drug dependency; terrorist acts; AIDS, human trafficking; delinquency, the presence of kitsch, etc., and these problems are more or less present also in the civilised perceived countries. We noticed that, both in a direct or unconscious way, the students had several wrong representations about reality. They believed that a civilised person did not have to cope with the above-mentioned issues or that within a civilised society all those issues were solved. Team (2) asked themselves "**How does non-civilisation affect us?**" Their answer referred only to the

"bad reputation of a country; frequent conflicts", when the consequences of the lack of civilisation were many and had a high impact upon one society or country.

Team (1) investigated the civilisation degree in Romania and in their own county: "**Situation in Romania:** Romania has certain problems that have drawn our attention and that cannot be solved fast: the Romanian human trafficking, sexual and other types of aggressions. Romania also has the following problems: refugees, sadness, stress, noise, dirtiness, zero tolerance, phonic, water, air, and soil pollution, drug use, smoking, panicking, crowding, chaos, violence, law level of culture". "**Situation in Bistrița-Năsăud**: our county has to cope especially with dirtiness, garbage and pollution (the garbage pit in the periphery of the town, the destruction of the green and of the environment, air and river pollution), eating seeds in the street is a habit in our town, the in fashion vulgar language." We noticed that the students perceived differently the situation in Romania and the one in their county and that the negative aspects they identified in the environment they lived in had a great impact on them. The students became aware that those problems are so big that they could not be solved fast ("from today until tomorrow").

3) Solving the Problem. Like in any case study, after the diagnostic, came the "treatment". The students were challenged to identify measures that may have been taken in order to prevent, avoid or diminish any problems, to search for solutions. The students proposed the following necessary measures and solutions:

- *Within the educational system*: educating the students on this theme, in their schools; learning through this theme during the discussion hours and during the optional courses (1); introducing in schools programmes on this theme; promoting good manner books; educational programmes (2);

- *Within the diverse groups of the society*: debating different issues in a group (family, with the colleagues, in school, at the local level, and in society); temporarily excludingn the uncivilised (1); making the parents aware of their child' bad education; educational programmes (2);

- *At the individual level* (personal decisions): enriching personal general culture (through reading); giving up bad habits (drinking, smoking, taking drugs, lying, being lazy, gossiping); giving up vices permanently; the grown-up should give good examples to the young; having good manners; respecting others' values and opinions (1); voting; educating the young; involving the young in the problems of the society; exercising one's rights as a citizen (3);

- *At the administrative level:* creating more re-education centres; places for loisir (1); enforcing high fines; promoting information campaigns (2); observing the law (sanctions); fighting against terrorism and drugs (3);

- *At the law level*: protecting nature, flora and fauna; fighting against racism (1); implementing certain social help systems; fighting against corruption against terrorism, and drugs (3);

- *At the economic level:* implementing the advanced technologies in economy and implicitly the living standard growth (job, money); fighting against terrorism, and against drugs (3).

4) Assessment of the Quintets. We were interested less if the students observed the rules for writing the quintet (Steele, Meredith, Temple, 1998). We were interested more in their representations of civilisation synthesized in the words of the five lines. The essence of the last lines was significant as it was there where the uncivilised individual was characterised by "stupidity" (1); the civilised individual was associated with "culture" (1) and "perfection" (3), and the lack of civilisation with "repulsion" (2). Team (1) remarked the danger of the uncivilised individuals' "fast spreading", and team (3) noticed that "civilisation shows the individual's self", and this was relevant for their self-education. The conclusion of team (2) was significant as the students asserted that "non-civilisation" "should be quickly eradicated."

Uncivilised	Civilised
Indiscrete Uninformed	Clean Smart
They Lie Offend Destroy	They Respect Protect Tolerate
And spread fast	And use correct language
Stupidity (1)	Culture (1)
Non-civilisation	Civilised
Omnipresent Caching	Kind Respectful
It Degrades Spoils Tricks	They Help Organise Communicate
It must be quickly eradicated	Civilisation shows the individual's self
Repulsion (2)	Perfection (3)

5) Analysis of the sigla. Team (1) presented two sigla: the civilised individuals were presented climbing a pyramid with steps, and the uncivilised ones were presented throwing waste materials on the entire Earth. Team (2) represented civilisation as a car, and the lack of civilisation as a horse cart, both vehicles heading in opposite directions (figure 1).

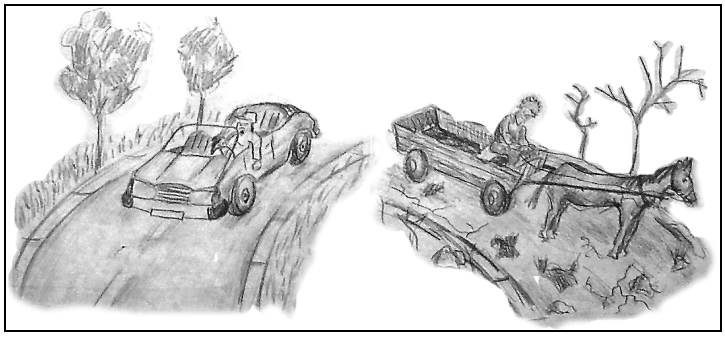

Fig. 1. Sigla 1: civilisation and lack of civilisation.

In the second sigla (figure 2), the students symbolised civilisation as a man dressed up in a suit and fighting in a duel a barefoot man, wearing torn and patched clothes.

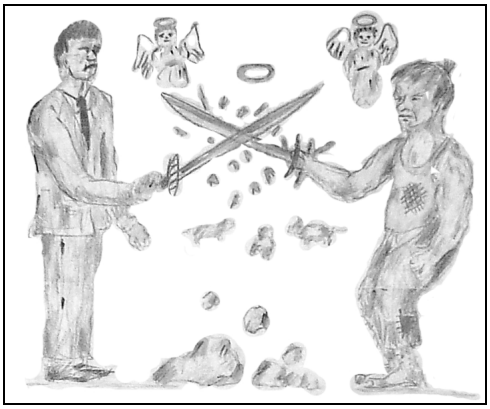

Fig. 2. Sigla 2: civilisation and lack of civilisation.

The students symbolised the possible end of the fight between civilisation and "lack of civilisation" by drawing two angels that led to the idea that at the end of that duel both fighters died and ended up in heaven.

Team (3) represented, in the centre of the poster, a man holding in the right hand the (+) sign symbolising the attributes of civilisation and the (-) sign in the left hand and symbolising the problems caused by the lack of civilisation (figure 3). The latter was heavier than the positive aspects.

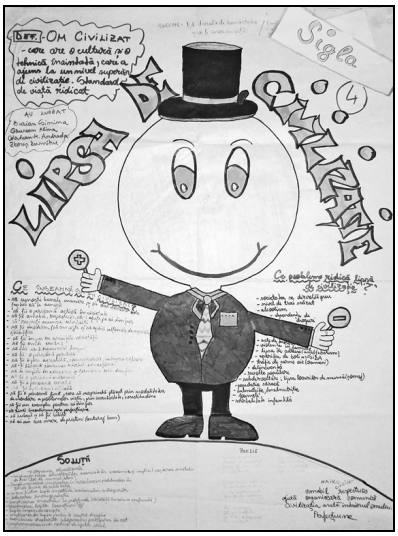

Fig. 3. Sigla 3: civilisation and lack of civilisation.

6) Analysis of the Students' Conclusions

Team (1) drew dark, pessimist, recording-facts conclusions:

- We live in an uncivilised world.
- Our time civilisation creates monsters (e.g. mass media).
- Many people are illiterate, thieves, corrupt, lazy, use drugs because of ignorance or bad information.
- Many people (the majority) do not have any good sense, use a vulgar vocabulary, do not respect other people, do not protect nature, and choose bad loisir.
- Many TV shows are non-educational, while promoting violence and vulgarity.
- Ignorance leads to non-civilisation.
- In conclusion, lack of civilisation is obvious everywhere!

Team (2) synthesized their conclusion on civilisation using the following ideas: "Civilised life is like the cream cake: it takes much time to be cooked, but everybody will notice that it tastes good". The members of the team drew our attention to the efforts that people had to do to be civilised, but also about the benefits of a civilised society for all. Team (3) presented their conclusions using two *slogans*: "Prove that you are well educated and you will be someone!" "Should you civilised be, continuously smiling you will be!"

Conclusions

We drew several conclusions after the analysis and the interpretation of the students' posters:

- During conceptualisation, the 13-14 year old students operated more at the concrete level than at the abstract one. They selected the information taken from the dictionaries according to their representations of the respective concept and not according to logic criteria. They did not quote the used bibliography.
- The students discovered the attributes of civilization and the ones of the lack of civilization especially at the social-individual and collective level, without discovering the most important attributes from the technological and economic perspective.
- On the basis of their direct and indirect observations, the students perceived subjectively and differently the situation in their county, the one in Romania, and in the other countries.
- The negative aspects of the lack of civilisation that the students noticed in the environment they lived in had a great impact upon them.
- When the students looked for solutions to the problems caused by lack of civilisation, they became aware that these problems were really big and that they could not be solved "from today until tomorrow". They drew the pertinent conclusion that each citizen had to contribute to raising the civilisation level where he or she lived.

• Through the content of their posters, the students demonstrated their competence acquired during several years of documentation, selection and graphical organization of information and images on a certain theme.

• The students proved to be creative in conceiving the sigla, the quintets, and the slogans.

We noticed the positive impact that the creation of the posters had on students during their period of formation: they had the chance of forming themselves as future responsible citizens and of optimally integrating themselves within a more civilized society and a better world.

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UNE ETUDE SUR UNE NOUVELLE EXPRESSION DANS LA DIDACTIQUE « L'ENFANT EPISTEMOLOGUE »

FLORENTINA CIOMOS

ABSTRACT. One important objective of modern didactics is to elaborate some strategies so that pupils are able to properly access the knowledge thought by their teachers. The partial or full access to the information allows pupils to adequately process knowledge, which furthermore causes detaching from the real content of information and also a "critical reflection" upon its structure and manner of assimilation. At this moment can we make evident the main idea, the one accompanied by the expression "epistemolog pupil". If the pupil is an epistemolog one, he may become a professor to his classmates. In this way, he is able to express himself at the same cognitive level in order to communicate with his classmates. This experiment may represent a significant track to facilitate the pupil's understanding of the information.

INTRODUCTION

Ces dernières décennies on attache une importance accrue à la pensée critique qui, en fin de compte, est basée sur la réflexion. On souligne également l'importance de la réflexion(en fait de la métacognition) pour l'assimilation des connaissances dans différents domaines scientifiques. C'est dans ce contexte que nous nous sommes proposé de soumettre à l'attention l'expression « enfant épistémologue » utilisée dans la didactique à partir de 1964.

POINT DE VUE THEORIQUE

Cette expression a été revendiquée par Seymour Papert, chercheur au Centre d'épistémologie génétique dirigé par Jean Piaget. Papert a eu comme point de départ l'idée soutenue par Piaget selon laquelle « l'enfant est le bâtisseur actif de ses propres structures intellectuelles ». Cette affirmation repose à son tour sur la génèse des connaissances chez les enfants.

Dans ce qui suit, nous analyserons les sens possibles de l'expression «enfant épistémologue ». L'affirmation selon laquelle « penser sur la pensée » engendre l'apparition de l'épistémologiste, a un caractère superficiel et réductionniste pour l'épistémologie. Elle peut être considérée pareille à une réflexion sur la science mais qui ne se confond pas avec la science même.

Il y a plusieurs orientations quant à la signification du terme d'épistémologie dont nous mentionnerons quatre:

1. L'épistémologie peut avoir pour objet d'étude la science du passé (l'histoire) et cherche à découvrir les erreurs, les fausses routes, les institutions sur le « passé », etc.
2. L'épistémologie peut prévoir ce que la science devrait être dans sa pureté et rigueur.
3. L'épistémologie peut observer la manière dont la science se manifeste, manière acceptée par la communauté scientifique du moment respectif.
4. L'épistémologie peut rechercher sur les caractéristiques de la connaissance scientifique, en les cherchant dans la génèse de la connaissance et en s'appuyant sur l'observation empirique de l'enfant (Drowin, Anne-Marie, 1991).
5. De même, l'épistémologie, au sens restreint, peut être définie comme « étude critique des sciences » et, au sens large, comme une « théorie de la connaissance, de la manière de s'approprier les connaissances ». Nous mentionnons que l'épistémologie se distingue aussi bien de la méthodologie de la connaissance que de la théorie de la connaissance (gnoséologie). En fait elle essaie de se délimiter de la philosophie antique pour se constituer en « jeune »science à part entière. On réalise une vraie rupture par rapport à la tradition philosophique (qui devient une« préhistoire »de l'épistémologie scientifique).

La relation entre l'épistémologie et l'épistémologie génétique peut être abordée sous deux angles:

- La première définit l'épistémologie comme « étude de la manière de constitution des connaissances validées »
- La deuxième définit l'épistémologie comme étude du passage d'un niveau de connaissance inférieur à un autre supérieur, en s'appuyant sur la génèse des connaissances (Piaget, J., 1967).
- Anne-Marie Drowin met en évidence cinq relations entre l'épistémologie de l'enfant et les démarches de celui-ci:

1. L'épistémologie de l'enfant comme introspection. L'enfant peut « penser sur la pensée ». Cette formulation évoque une réflexion de deuxième degré et offre la possibilité à l'enfant de prendre conscience de ce dont, initialement, il n'était pas conscient, de manifester sa propre métacognition;

2. L'épistémologie de l'enfant comme démarche prospective. La réflexion sur la pensée se matérialise dans l'explicitation d'un projet, la justification d'une méthode ou l'anticipation d'une démarche;

3. L'épistémologie comme bilan des acquis. L'enfant « épistémologue» est stimulé à réaliser un bilan des acquis ainsi qu'une évaluation de ceux-ci.

4. L'épistémologie de l'enfant comme réflexion sur la science. Le bilan des connaissances acquises est surpassé par l'explicitation de la manière dont ces connaissances sont valorisées ainsi que par la mise en évidence des caractéristiques de la démarche scientifique;

5. L'épistémologie de l'enfant comme démarche pédagogique. Bachelard soutient que la plus grande efficience dans l'apprentissage se manifeste au moment où l'apprenant (élève) doit apprendre à d'autres (camarades). De la sorte, les connaissances scientifiques garderont leur dynamisme. Plus de situation psychologique des deux camps: d'un côté l'opposition et l'incompréhension (des élèves) et de l'autre l'impulsivité et l'autorité (des enseignants)

Il faut dire que les évaluations alternatives réalisées à base de projets conçus et mis en œuvre par des élèves, devant des élèves, se constituent en tetatives du genre « les élèves enseignent aux élèves ».

Quand il dresse un projet (un compte-rendu)l' élève est incité à tirer au clair pour lui-même certains concepts(acquis en classe ou découverts par lui-même à travers la documentation) pour qu'il puisse, par la suite, les transmettre à ses camarades. Souvent les questions posées par ces derniers stimuleront l'élève à expliciter, de façon accessible, le concept, ce qui favorisera un traitement plus approfondi de celui-ci. Autrement dit, il y a une dynamique bilatérale des connaissances réalisées à un niveau cognitif proche (Astolfi, J. -P., Peterfalvi, B., 1993).

POINT DE VUE PRATIQUE. APPLICATION

Dans ce contexte nous avons initié une expérience dans le cadre de l'Atelier de chimie de l'Ecole nr. 10 de Zalau, en 2005, avec la collaboration de Mme Claudia Radu, professeur de chimie.

On a demandé à un élève de XI-ème, membre du Cercle de chimie, de rédiger un tavail sur le thème « La réaction d'oxydation »

Dans les manuels de chimie la réaction d'oxydation est introduite par des exemples expérimentaux au niveau macroscopique, observée sans aucun truchement par les élèves, comme une réaction entre métaux ou non métaux et l'oxygène de l'air.

De tels exemples pourraient être les réactions entre magnésium et oxygène ou fleur de soufre et oxygène:

$2Mg+O_2 = 2MgO$

$S+O_2 = SO_2$

A chaque fois on remarque une croissance de la masse de la substance initiale entrée en réaction (magnésium ou soufre) après avoir englobé dans le produit final (MgO ou SO_2) l'oxygène.

Au niveau microscopique, et le magnésium et le soufre perdent (cèdent)des électrons pour devenir des ions positifs aux nombres d'oxydation: + 2 respectivement + 4.

$Mg^o - 2e^- \rightarrow Mg^{+2}$

$S^o - 4e^- \rightarrow S^{+4}$

Au transfert de connaissances du niveau macroscopique à celui microscopique apparaît un « obstacle épistémique ». Au niveau macroscopique on remarque une croissance de masse et à celui microscopique une perte d'électrons.

L'existence de cet obstacle a été saisie par un élève et traduite dans la question suivante: « L'oxydation est-ce une croissance ou une diminution? »

La réponse de l'élève référent a été spontannée, intuitive et correcte: l'oxydation représente une croissance aux deux niveaux. Au niveau macroscopique la masse de l'oxyde résulté est plus grande que celle du métal ou non métal dont elle s'est formée et au niveau microscopique NO du métal ou non métal croît (du point de vue algébrique) de zéro à +2, respectivement +4.

Cette question n'a pas été adressée au professeur, en classe, lors de l'approche de ce thème, vu que les pratiques transmissives ne permettent pas aux élèves d'exprimer et de remettre en cause leurs représentations.

L'explication fournie par l'élève référent, par transfert adéquat de connaissances entre les deux niveaux macroscopique et microscopique, met en évidence un degré plus élevé de traitement des informations chez lui.

CONCLUSIONS

La capacité de transfert, mentionnée ci-dessus, est due au volume et au potentiel d'organiser des connaissances, aux habiletés métacognitives du sujet, à la compétence de traiter les informations dont il dispose à un moment donné (Miclea, M., Lemeni, C., 1999). Plus la réflexion sur sa propre pratique résolutive est intense, plus la possibilité d'organiser les connaissances dans la mémoire de longue durée s'accroît. L'organisation des connaissances implique une prise de conscience des interrelations entre les connaissances et, implicitement, le transfert de signification d'une connaissance à l'autre. Par conséquent, les capacités métacognitives supérieures favorisent le transert correct.

La démarche expérimentale qu'on vient de présenter a l'intuition du sens du terme « enfant épistémologue » et suggère un retour au même Bachelard qui soutient qu'un milieu jeune (les élèves) aurait un caractère plus formatif qu'un autre adulte (les professeurs) (Bachelard, G., 1969).

Certes, une telle réflexion met en relief la dynamique de l'apprentissage qui ne peut pas être un enregistrement passif des connaissances. On ne pourrait prétendre que l'élève (l'enfant) « fasse de l'épistémologie » pour qu'il soit un vrai « enfant épistémolog », mais on pourrait le rendre sensible, sur le parcours des acquisitions conceptuelles, à ce qui est un concept scientifique et l'aider à devenir conscient non seulement de ce qu'il sait lui-même mais aussi de ce qu'est la connaissance. Ce processus long et délicat a une fin difficile à définir, mais l'important c'est que le discernement didactique réponde à l'option épistémologique.

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STUDIA UNIVERSITATIS BABEŞ-BOLYAI, PSYCHOLOGIA-PAEDAGOGIA, LI, 1, 2006

COOPERATIVE LEARNING- AN EFFICIENT APPROACH FOR ACADEMIC ACHIEVEMENT

ADRIAN ROŞAN[*]

ABSTRACT. This is an study designed to describe the effect on interactions between students based on dialogs in English promoted by the model of cooperative learning in school self esteem and the school avoidance behavior. The hypothesis of this study was that the model of cooperative learning determines the increase of the general performance, but also the bettering of the school self esteem and the decrease of the school avoidance behavior by the pupils, in comparison with the traditional frontal model of training. The model of cooperative learning has been chosen for this type of intervention in this study because it involves all the elements of cooperative learning of heterogeneous groups, positive interdependency, personal contribution, social and cooperating skills, group processing. Even if the study didn't identify significant differences from a statistic point of view between the control group and the experimental group regarding the last two dependent variables (school self esteem and school avoidance behavior), it showed that the cooperative learning model is more efficient than the training based on the usage of the handbook for the improvement of performance in reading in a foreign language of gymnasium pupils

Key words: model of cooperative learning, school self esteem, school avoidance behavior

The methodology of research

The educational and social context on a world scale is represented by a multilinguistic environment in which English is used mostly in mass media and communicating situations. In the Romanian educational system French and English, beside other world wide used languages are learned as foreign languages and are appreciated for their educational and cultural meaning. Still, we are achieving an increase of teaching English over French, because English is considered as more often used for communication in science, trading and technology. Teaching foreign languages is made in a competitive manner and doesn't offer opportunities for active learning and considerable communication between students, because they have to achieve performances higher than their colleagues, to have better grades and to be appreciated. There is the need to examine the theoretical relevance and the efficiency of cooperative learning, as an

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educational facing in a school that although made significant steps on the path of educational reform still keeps traditional practice. On the same time we base on the assumption that the model of cooperative learning will promote active learning and the development of interactions between pupils using English.

The objectives and hypothesis of research

The objectives of this research aim the effects of the model of cooperative learning in the acquisition of English over the performance in the lexical act, school self esteem and the avoidance of school behavior. These objectives are synthesized in these that follow:

- Evaluating the level of performance in reading English of gymnasium pupils;
- Evaluating the level of self esteem in gymnasium pupils;
- The investigation of the effects of the cooperative learning model on the performance of reading in English of gymnasium pupils;
- The investigation of the effect on interactions between students based on dialogs in English promoted by the model of cooperative learning over the school self esteem and the school avoidance behavior.

For the achievement of these objectives we tested the following hypothesis:

- The level of reading performance of gymnasium pupils that are learning a foreign language based on the cooperative learning model will be superior to the level of performance of gymnasium pupils that are learning a foreign language by the traditional practice of frontal training;
- The level of self esteem of gymnasium pupils that are learning a foreign language based on the cooperative learning model will be superior to the level of performance of gymnasium pupils that are learning a foreign language by the traditional practice of frontal training;
- The level of school avoidance behavior of gymnasium pupils that are learning a foreign language based on the cooperative learning model will be inferior to the level of school avoidance of gymnasium pupils that are learning a foreign language by the traditional practice of frontal training;

The approach of the research

The study involves a pretest – posttest design of the control group and had as variables school self esteem and school avoidance behavior, as well as the statement that a positive interaction with other persons for the achievement of common goals, established the increase of school self esteem and the decrease of the school avoidance behavior (Johnson, Johnson and Stanne, 2000). School self esteem and psychosocial adjustment have a critical importance because they improve pupils resistance to life disappointments, establish certainty in the assumption of decisions and form happy and creative individualities (Slavin, 1995).

The model of cooperative learning has been chosen for this type of intervention in this study because it involves all the elements of cooperative learning of heterogeneous groups, positive interdependency, personal contribution, social and cooperating skills, group processing.

At the same time, examining of this model is necessary in the context of teaching foreign languages in general, of this study in particular way, and owing to the deficit of information regarding this subject.

The sample

The study contained a sample of 56 gymnasium pupils from Gr. Sc. Ch. Ind. TERAPIA that learned foreign languages that come from families with a socioeconomic and educational low status. That sample was made from 29 boys and 27 girls with an age limit between 11-12 years old. The subjects were chosen from a typical public quarter school and were randomly divided in a control group and an experimental group. The study lasted 10 weeks. The experimental group included 28 subjects that formed 7 teams made by 4 members according to the presented strategy. 28 subjects from the control group studied the same material according to the methods presented in the handbook.

Research methods

With a view to realize this study the following tools of evaluation and training the subjects was used:

- *The evaluating scale of school self esteem (adjustment after Johnson and Johnson, 1996)*
- *The evaluating scale of the school avoidance behavior (adjustment after Johnson and Johnson, 1996)*
- *Evaluating test of performance entitled "The new singles"*
- *Evaluating test of performance entitled "The problems of Stench"*
- *Inventory regarding the teachers role in cooperative learning*
- *Lesson projects – experimental group*
- *Lesson projects – control group*
- *Working chart "What was my contribution to the groups success?"*

The self esteem was defined in the context of this study as being "the perception of self as a capable pupil, competent and with successes" (Johnson and Johnson, 1996, p 67) and was measured by a Likert subscale with 5 items, adjusted after Johnson and Johnson (1996), the school avoidance behavior was measured by a Likert subscale with 11 items, also adjusted after Johnson and Johnson .

The internal consistency of the subscale was a=.78 and a=.81 based on the obtained data. Besides, an evaluating pretest of performance was elaborated for this study and was administrated to the subjects one week before the intervention. This test was based on a selected material, entitled "The new singles" and included 12 items that

measured the understanding of the ideas mentioned on this text, as well as a superior processing that required collisions and interpretations. The same test was applied as a posttest to both the groups at the end of the intervention. The test is anchored in a field that approaches the results of learning and the aimed abilities during the investigation. These results and abilities contain the usage of contextual indexes (syntactical and semantically) and the reading strategies in understanding the printed speech.

The posttest was based on a material entitled "The problems of Stench" that wasn't before read to the subjects and included 9 items of multiple choices, 3 Yes or No items and 8 sentence completion items that measured the investigated results and abilities.

The content validity of the test was established by the researer, the program coordinator and a teacher who applied the test, using a specification table suggested by Sax (1980). They established that 4 items measured the text comprehension, 11 items measured superior abilities, and 5 items measured the usage of contextual indexes for facilitating the comprehension.

The study

The study was proceeded in two stages. The first stage was made up of a forming program of 5 teachers, including a teacher that agreed to participate in this research by applying the components of cooperative learning (heterogeneous groups, positive interdependency, personal contributions, social abilities, group processing) in teaching the foreign language. This stage lasted 2 days and contained a total of 10 hours of training with an accent over the objectives of forming the specific skills of collaborating in school, group dividing of the pupils, room arrangement, role appointment and material planning. The participating teachers were trained to explain the learning charges, the structuring of the positive interdependency objectives, personal contribution and in-group cooperation. The teachers learned how to select and facilitate the processing and the evaluation of the groups functioning in pupils. The purpose of the first stage was to enlarge the fidelity of the experiment by the training offered to the teachers that will ---- the learned strategy in the second stage of the experiment.

The second stage of the study consisted of the program coordinators and a teacher's activity that agreed to participate in the research, to determine the content, the results and the learning abilities that need to be realized during the research period. Moreover, detailed lesson projects were elaborated, to teach the same content and form the same abilities in the two groups: the control and the experimental one. The lesson projects for the experimental group were based on the professor's role inventory and the lesson's model elaborated by Johnson, Johnson and Holubec (1987). The projects include lesson resumes, reference objectives a needed resources list, with specifications regarding the time factor, group size, group structure and role distribution, room arrangement. The lesson projects included learning charges description, the positive interdepency structuring of

the procedure and personal contribution, success criteria. The projects specify the social and behavior abilities that are expected and include monitoring procedures of the group and its functionality.

The lesson projects for the control group were based on reading the same material according to the training procedures (activities) suggested in the pupil's handbook. The procedures were organized in 3 stages of the lesson: the initial moment, the training and participation and the final moment. These stages offered opportunities for the achievement of the objectives regarding the written and oral form as well as the integrated discipline, using a wide variety of training techniques like: brainstorming, question – answer conversations, understanding scales, crosswords and graphic drafts.

Both types of lesson projects proposed the same reference objectives and used the same selected materials. However, the projects for the experimental group offered interaction opportunities between team members. It concerned the development of social and cooperating abilities, building the team spirit and fellowship.

On the contrary, the control group pupils worked individually and presented their answers in front of their colleagues. One of the teachers was trained in the first stage, to participate in the second stage of the study.

To eliminate any source of bias in using the method, the teacher taught the two groups and wasn't stimulated by the researcher to encourage cooperative learning in comparison with traditional training. The researcher didn't work directly with the pupils, and the posttest evaluation of the dependent variables was realized to reduce the possible influence of the researcher, by eliminating the items with an open answer, that needed subjective judgments. The reliability of the experiment was ensured by the teacher's training in the first stage, the precise marking of the recommendations and the elaboration of detailed lesson projects, the observation of the forms to ensure the congruence between the teacher's behavior and the intervention aspects.

The results of the research

The hypothesis of this study was that the model of cooperative learning determines the increase of the general performance, but also the bettering of the school self esteem and the decrease of the school avoidance behavior by the pupils, in comparison with the traditional frontal model of training.

Table 1 presents the results of the test by the analysis of the co-variance. The testing conditions (experiment vs. control) were considered independent variables, while the performance, school self esteem and school avoidance behavior were identified as dependable variables.

The results of the performance test were used as co-variants to control any potential preexistent difference in the two groups performance: the control and the experimental one. The data from table 1 show that there were no significant differences to $p<.05$ between the two groups, regarding school self esteem $F(1.44)=.48$, $P=.49$, also, no significant differences in the school avoidance behavior $F(1,53)=7.69$, $P=.00$

Table 1.

The co-variance analysis: performance, self esteem, school avoidance behavior

Group	Performance		School self esteem		School avoidance behavior	
	X	SD	X	SD	X	SD
Experimental N=28	48.33	16.18	14.73	2.30	31.18	3.56
Control N=28	44.33	13.36	15.19	2.26	32.00	3.21
F	7.69*		.48		1.23	

*p<.005

The study investigated the effects of the cooperative learning model over the pupils' performance and the decrease of the school avoidance behavior.

Even if the study didn't identify significant differences from a statistic point of view between the control group and the experimental group regarding the last two dependent variables (school self esteem and school avoidance behavior), it showed that the cooperative learning model is more efficient than the training based on the usage of the handbook for the improvement of performance in reading in a foreign language of gymnasium pupils. A corroboration with the results of previous studies was made, regarding the positive effect of cooperative learning, improving the performance of reading in a foreign language (Greenwood, Delquadri and Hall, 1989, Stevens, Madden, Slavin and Farnish, 1987).

The results of the research suggest that the reading performance can be improved in cooperative interactions in small groups in a stimulating environment. But, like it was before mentioned, the results of this study indicate that cooperative learning doesn't facilitate self esteem and the decrease in the school avoidance behavior being based on the assumption that the pupils, by using this model, feel important because they fulfill roles that are essential in the progress of the charge by the group. They posses information and/ or resources that are indispensable to the group functioning.

Interactions between team members also decrease the school avoidance behavior showed by the pupils and encourage their psychosocial adaptation by promoting the individual efforts of each pupil, necessary to the groups success. But significant progresses regarding school self esteem and psychosocial adaptation can't be realized by experiments and short interventions. Former studies also lead to insignificant and inconclusive results.

Implications and conclusions

The results of this study refer to two aspects. First of all, the positive effects of cooperative learning regarding reading performance, both in a

nonlinguistic context and the usage of a foreign language, are sustained by the results of this study. The pedagogic implications determine the appliance of this model in forms, because pupils participate in significant interactions in a stimulating educational environment, that determines the faster learning of the language in the multiliguistic context, characterized by competitive training and limited opportunities for social interactions using the foreign language.

Second of all, if there isn't a theoretical support, the improvement of self-esteem and school avoidance behavior can't be realized by short interventions. Longitudinal studies that determine the long-term effect of the model in these psycho-emotional fields are necessary. Follow up research is needed to describe the conditions in which cooperative learning improves the performance in the cognitive and non-cognitive field of training.

A special interest must be assigned to the studies that aim controlled experiments that investigate the relative efficiency of different cooperative learning model and describe the conditions in which these models become efficient in obtaining academic and affective results as part of a modern curriculum of teaching a foreign language.

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STUDIA UNIVERSITATIS BABEŞ-BOLYAI, PSYCHOLOGIA-PAEDAGOGIA, LI, 1, 2006

LES OBJECTIVES DE L'ÉDUCATION VISUELLE ET L'APPRENTISAGE DE LECTURE DANS LE CAS DES SUJETS AMBLYOPES

VASILE PREDA

ABSTRACT. This paper pesents a theoretical and methodological framework pertaining to: the diagnosis and treatment of strabismus and low vision; the psycho-physiological elements of visual behaviour involved in visual training, beginning with early intervention; the correctional, compensatory and formative objectives of visual training; the characteristics of the perceptive-motric structuring of graphic space in case of low vision persons; the psycho-paedagogical aspects of acquiring reading skils by low vsion persons.

KEY-WORDS: low vision, strabismus, early intervention, visual behaviour, visual training, correctional objectives, compensatory objectives, formative objectives, reading skils.

L'évolution actuelle dans le domaine de la technologie et des sciences psychologiques, psychopédagogiques et médicales a permis de dégager des nouvelles tendances dans l'évaluation des facteurs psychophysiologiques de la vision, dans la compréhension de la rééducation fonctionnelle des enfants avec un déficit visuel et dans la compréhension du processus de l'apprentissage scolaire.

Dans le cas des sujets amblyopes et malvoyants, on insiste sur la rééducation des fonctions visuelles de base. En outre,'nous remarquons la tendance d'élaboration de certains instruments d'évaluation descriptifs et prédictifs qui concernent l'évolution du processus de rééducation fonctionnelle et une tendance évidente d'amélioration du contenu et du *design* des manuels scolaires.

Le psychopédagogue doit évaluer la fonctionnalité du champ opératif de la vision, en relation avec le style perceptif et le style cognitif qui sont impliqués dans l'apprentissage scolaire.

I. L'amblyopie - son dépistage et traitement

L'amblyopie strabique peut donc être évitée par une ***prévention efficace***: il faut s'assurer de la fixation par l'oeil strabique pour éviter cette suppression pathologique. Plus le strabisme a été précoce et le traitement tardif et plus le risque d'amblyopie est grand. En cas d'imposibilité de réaliser une mesure de l'acuité visuelle à 3 ans (échecs répétés), un examen par un ophtalmologiste est proposé,

comprenant un examen de la réfraction sous clyclopégie. Les situations suivantes justifient un examen ophtalmologique par un ophtalmologiste: les enfants présentant une pathologie ou des antécédents personnels ou familiaux favorisant l'apparition d'un facteur amblyogène; les enfants ayant des signes d'appel d'un trouble visuel.On insiste sur la nécessité de répéter les tests de dépistage du strabisme tout au long e la croissance de l'enfant.

L'amblyopie fonctionnelle est tout à fait accessible à un ***traitement de rééducation*** (occlusion, secteurs, pénalisation optique) mais ce traitement doit être poursuivi pendant des années. Le simple port des verres correcteurs chez un bébé strabique, sans occlusion, sans secteurs, sans pénalisation, n'empêche pas une amblyopie strabique de s'installer.

La vraie guérison du strabisme est rare. En effet, la guérison serait une isoacuité, un équilibre oculo-moteur normal et une bonne vision binoculaire. Ce but est rarement atteint car les anomalies motrices et sensorielles précoces sont difficilement réversibles.

Les cellules binoculaires corticales sont très fragiles et disparaissent si la fonction binoculaire ne peut s'exercer dans les premiers mois ou pendant cette période critique de développement de la fonction visuelle de 0 à 3 ans. Il est donc très rare de trouver une vision binoculaire avec stéréoscopie chez les anciens strabiques. Par contre, il existe des "adaptations" binoculaires tout à fait confortables, avec fusion périphérique et une certaine stéréopsie. Plus le traitement a été précoce, plus ces possibilités d'adaptation binoculaires sont préservées.

Il faut savoir qu'un strabisme du bébé peut persister toute l'enfance malgré les lunettes et un traitement médical bien conduit. Par contre, ***l'amblyopie doit être enrayée*** car cela est possible si le traitement est précoce.

Lorsque l'enfant est très hypermétrope, il peut être "droit" avec ses verres et loucher sans correction en raison de facteurs accommodatifs. Dans ces cas, seule la diminution de l'hypermétropie avec l'âge arrangera les choses, mais il faut parfois attendre 10 ans.

Tout cela est assez complexe et les parents ne comprennent pas toujours pourquoi on ne peut pas guérir le strabisme de leur enfant en quelque mois. Il faut leur expliquer le pourquoi et le comment de la fonction binoculaire pour qu'ils acceptent l'idée d'un traitement et d'une surveillance de plusieurs années et l'idée d'un confort visuel sans vision binoculaire.

L'absence de vision binoculaire est compatible avec une vie normale parce que l'enfant s'est adapté à cet état. Cependant cela reste un léger handicap pour l'apprentissage de la lecture et de l'écriture, en éducation physique et pour l'orientation professionnelle en raison d'une mauvaise localisation dans l'espace et de difficultés dans l'appréciation exacte des distances.

Chez les sujets malvoyants ou chez les enfants amblyopes l'éducation visuelle est, certes, fondamentale.

II. L'éducation visuelle - thérapie complexe psychopédagogique formative et corrective-compensatoire

1. Des éléments psycho-physiolgiques de la vision

Le regard a certes une grande importance dans sa fonction et son expression. Dans notre profession éducative, des termes sont employés permettant de situer l'enfant en fonction de l'utilisation de cette fonction sensorielle complexe. Éveiller, et développer l'acuité visuelle de l'enfant permettent d'améliorer sa communication avec son entourage, renforcent son attention, sa réceptivité et ses perceptions (Toupence, 1992).

Les différents éléments qui constituent l'ensemble d'une bonne vue et qui mettent en jeu les liaisons nerveuses des yeux et du cerveau, outre l'acuité visuelle, sont:

- la sensibilité de contraste (distinguer un objet sur un fond de même couleur);
- accomodation qui est le réflexe d'adapation de l'oeil à des distances différentes;
- la convergence qui consiste à voir avec les deux yeux, à percevoir la profondeur et le relief;
- la sensibilité de l'oeil aux différences d'intensité de la lumière et de la couleur;
- l'axe parallèle du regard, c'est-à-dire le parallélisme des yeux qui permet la vision binoculaire; différents auteurs s'accordent pour situer cette potentialité vers 4 mois et elle va continuer à se développer jusqu'à 5 ou 6 ans.

Le cerveau interprète constamment les images et les perceptions sensitives que les yeux lui communiquent. C'est le cas concernant la vision de la troisième dimension, alors que l'image reçue par la rétine est en deux dimensions. Si une personne ne peut superposer les deux images reçues, soit elle voit double, soit son cerveau annule la vision d'un des yeux; la notion de profondeur disparaît. Il nous paraît important de préciser que, si nous utilisons les voies sensorielles pour donner des informations à l'enfant, la perception sensorielle n'est pas la seule présente, elle se fond dans l'ambiance mentale de l'enfant et son cerveau interprète ce qu'il perçoit en fonction de ses expériences passées et de ses croyances.

Partant de l'idée maîtresse que le bébé suit un programme très stricte dans son développement sensori-moteur, nous vérifions quelles sont les lacunes présentées par l'enfant et peuvent devenir un guide dans l'élaboration de la trame du programme éducatif quotidien de stimulations. Le ou les objectifs à atteindre, analysés régulièrement, constituent l'autre fil conducteur de cette prise en charge. L'intérêt majeur de ce système éducatif est l'organisation et la planification autour de l'enfant du projet et de sa pratique. Le programme est établi et planifié sur une période de plusieurs jours; l'intensité, la fréquence et la durée en sont les facteurs d'une réussite possible (Toupence, 1992, p. 81).

Prenons l'exemple de la vision. Partant du réflexe le plus simple qui est le réflexe pupillaire, nous allons passer de l'obscurité à la distinction de la lumière, suivre des yeux, reconnaître les détails, vérifier la convergence, reconnaître les

images d'objets familiers, reconnaître des lettres, des nombres ou des mots isolés et simples. Plus tard, ce sera la lecture des mots isolés et leur compréhension et. finalement la lecture et la compréhension de phrases simples. Nous observons que cette compétence chemine ainsi progressivement de la naissance jusqu'à l'âge de 6 ans.

2. Des composantes et buts de l'éducation visuelle

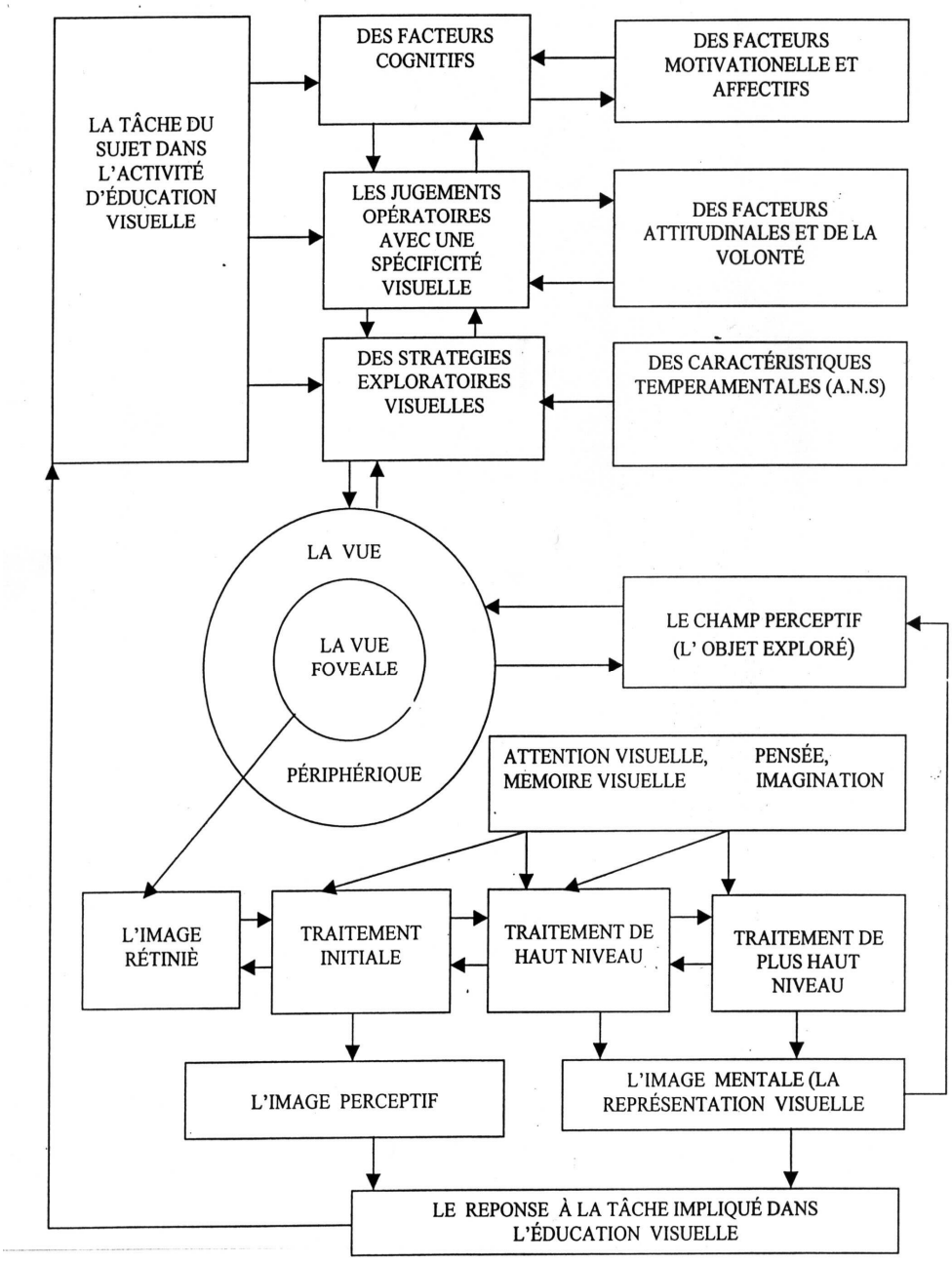
L'éducation visuelle est un objectif spécifique d'une grande importance pour le bon déroulement des activités instructives-éducatives et correctives-compensatoires dans les écoles pour amblyopes, afin d'obtenir une intégration scolaire adéquate et, par la suite, une intégration socio-professionnelle éficace. En tenant compte du diagnostic ophtalmologique et psychopédagogique et du pronostic pour chaque cas, l'éducation visuelle est censé dynamiser, mobiliser les potentiels visuels des sujets; et cela en augmentant le plus possible les interrelations entre la capacité fonctionnelle réelle de la vue fovéale et périphérique, en mettant l'accent sur:

- le développement des stratégies exploratoires oculo-motrices;
- le développement des schèmes perceptifs;
- le développement de l'attention visuelle; le développement de la coordination oculo-manuelle;
- le développement de la mémoire visuelle opérative et à long terme;
- le développement de la capacité de structuration perceptive, de représentation spatialle et des pensées opératoires à spécifique visuel.

Les interactions existantes entre les composantes psychophysiologiques et psychologiques et aussi entre les autres facteurs psychiques, cognitifs, affectifs et motivants, dépendants des caractéristiques de l'activité nerveuse supérieure (A.N.S.), facteurs atitudinaux et volitifs impliqués dans l'éducation visuelle sont présentes dans la figure 1.

L'éducation visuelle représente, donc, un objectif spécifique, avec des finalités correctives-compensatoires et formatives, suivi dans les écoles pour amblyopes ou dans les classes avec des élèves amblyopes. Un des paramètres centraux de l'éducation visuelle est la mise en action du potentiel visuel de chaque élève amblyope.

Pour projeter et réaliser les activités incluses dans l'éducation visuelle, les particularités de la “prise d'information” de chaque sujet et leur conséquences sur les perceptions et les représentations visuelles, sont considérées des aspects psychologiques d'importance majeure.



LES FACTEURS IMPLIQUÉS DANS L'ÉDUCATION VISUELLE

III. L'étude de la structuration perceptive-motrice de l'espace chez les amblyopes par l'utilisation de la "Figure Complexe Rey"

Nous avons utiliser la *Figure complexe Rey* d'une nouvelle manière, en procédant à l'enregistrement des mouvements oculaires afin de relever l'influence des particularités exploratoires sur la structuration perceptive-motrice de l'espace chez les amblyopes.

Chez les amblyopes, l'épreuve de la *Figure complexe Rey* met en évidence-le fait que la perception visuelle de ceux-ci manque, en grande mesure, de caractère instantané et d'automatisation. L'enregistrement des excursions oculaires démontre que chez les amblyopes plusieurs fixations et retours du regard sont nécessaires pour recevoir l'information, parallèlement aux efforts de mémorisation de la *Figure complexe.* Les sujets amblyopes qui explorent de façon inorganisée ou insuffisamment active la figure-stimulus et surtout ceux qui renoncent à l'effort de "voir" et ne fixent leur regard que sur un fragment de celle-ci, obtiennent de faibles résultats. La différence entre les moyennes des points obtenus par les amblyopes et par le groupe témoin est fort significative pour $p<.01$, dans le cas de la reproduction de mémoire et significative pour $p<.05$, dans le cas du copiage. Chez les sujets ayant pratiqué des exercices d'éducation visuelle pendant une période plus longue, l'exploration visuelle est beaucoup plus organisée, ce qui influence positivement la mémoire visuelle opérative et la capacité de structuration perceptive-motrice de l'espace graphique. Il vaut mieux, donc, ne pas parler de mémoire visuelle opérative et de capacité de structuration perceptive-motrice de l'espace chez les amblyopes en général, mais plutôt envisager les particularités psychophysiologiques de chaque sujet.

IV. L'apprentissage de la lecture chez les sujets amblyopes

Si l'acquisition de la langue s'effectue dans des situations spontanées, l'apprentissage de la lecture s'inscrit dans le cadre institutionnel de l'école. Savoir lire apparaît à tous comme la clé des apprentissages, c'est pourquoi cet apprentissage alimente de nombreuses polémiques, oppose des dogmatismes théoriques, entraîne la recherche des coupables de l'insuffisance de performances des élèves. Suivants les rapports, les enquêtes, les critères choisis, 20% à 30% des élèves qui sortent de l'école "ne savent pas lire". Très probablement cette situation a des causes multifactorielles et l'amélioration des résultats nécessitera la prise en compte de nombreux facteurs. Rien ne doit être négligé car il n'y a pas de solution univoque aux problèmes complexes (Zorman, Jacquier-Roux, 1992, p. 77).

Il existe une influence incertaine de la vision binoculaire sur l'apprentissage de la lecture. Cependant, les moyens d'étude à notre disposition pour l'étude de l'apprentissage de la lecture restent très grossiers. Le système des vergences, du fait de l'âge et de la correction optique, reste toujours mal exploré. L'étude de la vision stéréoscopique reste très globale et les tests à notre disposition suivent la loi du tout ou rien, ne permettant qu'une analyse très grossière. Le auteurs (Griffon, 1993, Fellenius, 1999; Gompel et coll., 2004) montrent les relations importantes entre

lecture et l'oculomotricité: il existe des corrélations intéressantees entre différents tests oculomoteurs et les capacités de jeunes apprentis lecteurs âgés de 5 à 6 ans. Les difficultés visuelles président des problèmes de lecture chez le june , et ce dès la maternelle. Fellenius (1999) précise que les difficultés de lecture – la lenteur, en particulier- peuvent varier selon l'intensité du handicap visuel (Tableau I).

Tabeau I

Répartition (%) des enfants selon l'existence d'un ou plusieurs troubles visuels

(après Lenne, 1994).

Trouble visuel	*Répartition selon la capacité de lecture*		
Aucun	28,00	40,00	32,00
Un	40,00	36,00	24,00
Plusieurs	52,00	32,00	16,00

Les mauvais lecteurs sont beaucoup plus nombreux chez les enfants ayant plusieurs troubles visuels. Ces sont les troubles de l'oculomotricité qui retentissent le plus sur l'apprentissage de la lecture. Ils sont suivis par la myopie et l'hypermetropie. Les difficultés à lire sont plus importantes s'il existe plusieurs anomailes associées (myopie et astigmatisme ou hypermetropie et astigmatisme).

Les auteurs associent dans leur ensemble les troubles oculomoteurs avec dyslexie (Casalis et Touzin, 1997; Cestnik et coll., 1998; Vidyasagar et coll.,1999). La lecture nécessite en effet une bonne oculomotricité visuelle. Les enfants porteurs d'un déficit visuel, bien pris en charge (correction par équipement optique adapté) et bien suivis, obtiennent les mêmes résultats aux tests de lecture que leurs camarades n'ayant pas de défaut visuel. Un dépistage précoce des déficits visuels chez les jeunes enfants, suivi si nécessaire d'une prise en chrage (rééducation visuelle, port d'une correction adaptée), apparaissent donc garants d'un meilleur apprentissage de la lecture. L'élément essentiel, dont l'efficacité n'est plus à démontrer, reste le dépistage de l'amblyopie et du strabisme. La correction optique totale reste le moyen le plus efficient pour obtenir du système visuel une information de qualité résistant à la fatigue (Pechereau, 1998, p. 25).

On constate que la lecture visuelle est rarement la solution exclusive, dès lors que, rappelons-le, l'amblyopie est très marquée et que la question du choix est posée. Les conditions sans lesquelles la lecture visuelle perd ses qualités spécifiques sont: *l'efficacité, la fiabilité, l'adaptabilité la fatigabilité, le pronostic visuel*. Ces critères ainsi dégagé, on comprend bien que la question du choix entre braille et noir se pose de façon différente selon les cas, à un moment ou, par ailleurs, la population concernée se diversifie de plus en plus.

Après Perez (1995, p. 104 - 105) les eléments de strategie du choix entre braille et noir sont:

a) jeune, stabilité visuelle (relativement garantie à court et moyen terme), lecture et écriture (ordinaires) lente mais sans fatigue particulaire: **noir**;
b) jeune, stabilité visuelle (relativement garantie à court et moyen terme), lecture et écriture (ordinaires) lentes et fatigantes: **noir** et **braille**;
c) jeune, stabilité visuelle (relativement garantie à court et moyen terme), lecture et écriture (ordinaires) lentes: **braille** et **noir**;
d) jeune, stabilité visuelle non garantie (à court et moyen terme), lecture et écriture normale ou lentes: **noir** et **braille**;
e) jeune, stabilité visuelle non garantie, lecture et écriture posibles ou lentes, fatigantes: **braille** et **noir.**

Cette *typologie* peut être étendue aux adultes sous réserve de rendre plus précisément et compte le profil général de la personne. Dans tous les cas, la nature du projet scolaire ou professionnel permet d'apporter les precisions suivantes:

- si des études longues sont envisageables, le braille doit étre systématiquement privillégié, tout en développant les techniques de consultation visuelle rapide et ponctuelle;

- si les perspectives proffesionnelles ne passent pas un recours constant à la lecture, une plus grande souplesse peut être admise. On rencontre cette situation en kinésithérapie, au détriment par conséquent du braille;

- si certaines formations exigent un accès aise à la lecture de l'ecran de l'ordinatteur. Ici, quelle que soit la durée de la formation, la prudence s'impose et faudra tenir compte avec rigueur des critères prédécemmnt énoncés *(adaptabilité, fiabilité et fatigabilité notamment).*

La solution mixte (noir et braille), qui offre la prépondérance à l'un ou l'autre des systèmes, est un garantie de souplesse et de plus grande efficacité.Ainsi, sera-t-il possible de bénéficier, notament, à la fois des apports de la rééducation fonctionelle et de ceux de l'outil exceptionnel que représente le braille informatique.

Au cours des quinze dernières années, les connaissances issues des recherches en sciences cognitives (neuropsychologie du développement, neurophysiologie cognitive, psychologie cognitive) ont mis en évidence le rôle des fonctions perceptive-sensorielles et métaphonologiques dans l'apprentissage de la lecture. C'est en utilisant ces connaissances que nous tentons d'améliorer nos capacités de dépistage des retards ou troubles des apprentissages, d'élaborer et d'évaluer des programmes d'entraînement des fonctions visuelle, auditive et des compétences métaphonologiques.

Il faut «consacrer le temps et les moyens nécessaires à évaluer la dynamique cognitive, le potentiel d'apprentissage»; accorder une juste place aux «différents axes des fonctions cognitives dont l'association est originale pour chaque enfant et doit servir de base à la construction d'un projet individualisé»; favoriser «l'existence d'une autonomie sociale et de vie quotidienne en regard des acquis cognitifs», mettre en place une «éducation à la communication», une «éducation cognitive polysensorielle» (Deleau, Weil-Barais, 1994, p. 12-13).

La démocratisation de l'enseignement, l'allongement de la scolarité obligatoire ainsi que l'augmentation des connaissances que les individus des sociétés industrielles avancées doivent acquérir confrontent les institutions scolaires à des problèmes nouveaux.

La diversification des compétences et des modes d'accès à la culture est à l'ordre du jour. On parle beaucoup en particulier d'adapter l'enseignement au profil cognitif des élèves. Mais, d'une part, on connaît mal ces profils et, d'autre part, les bases théoriques qui les fondent sont encore incertaines. Il y a donc lieu de développer des études contrastives sur des populations d'élèves supposées avoir des modes d'accès aux connaissances différents et impliqués dans des pédagogies innovantes.

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ENCOURAGING EARLY COMMUNICATION DEVELOPMENT AT DEAFBLIND CHILDREN

ANDREA HATHAZI*

ABSTRACT. Daily living activities provide the early context for a child to communicate and to affect the world and people around. He learns to imitate and take turns. Recognizing repeated routines and patterns of activities, warning or alerting signals, putting two and two together to attribute meaning to sounds, touches and objects; all are facilitated in the context of early care. Encouraging early communication means that we need to structure the environment and materials in it more deliberately to ensure that the child can develop as wide a range of communication skills. Opportunity, feed-back, reinforcement and encouragement all have to be planned, with a view to making the material world accessible, responsive and reactive.

Very young children learn to communicate during everyday activities, family routines, and interactions with parents or caregivers. These are natural experiences developed in familiar contexts through which the infants develop attachment to caregivers who respond to their initiatives, signals and needs. Caregivers also develop an emotional bond as a result of the infant's response to their communication (Chen, D., 2002). Early communication skills promote a child's development of self-concept, participation in activities and understanding the environment. It also creates the skills of anticipation and control over the events and people from the surrounding environment.

In the development of an able child, the communication skills are acquired through interactions with their parents or carers. They learn and share in eye contact, vocalizing, and turn taking from almost the moment they are born. They are constantly surrounded by visual and auditory stimuli, language and conversation, and parents are encouraging gradually the imitation and participation. Thus, from all these experiences the child starts communicating.

When a child is deafblind and he has the combined visual and hearing losses, the process of developing communication skills is impaired. These children may communicate in ways that are not easily understood by their families who don't answer the child's initiative in communication. For the deafblind child the process is disrupted from the very beginning. A child born with deafblindness may not be able to make eye contact or hear what it is said by self or others, and

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perceptual problems distort the information received form the environment. This leads either to isolation, to a passive and uninterested behavior or to a state of constant alarm and aggressive behavior.

It is very important to promote early communication development. The majority of infants who are deafblind are not totally deaf and blind. They have residual sight and hearing that can help them in accessing communication and information. However, many deafblind children have additional disabilities like developmental delays, severe physical disabilities or medical problems that influence their participation in social interaction and communication opportunities. Many parents need assistance to interpret the infant's atypical signals and give them meanings.

Communication with the deafblind child is not something that just happens. Intervention is needed to plan consistent and structured approaches, which make most of their residual vision and hearing, compensate for the sensory losses, and take into consideration their level of development.

Early communication development is based on four ideas:

- Developing a close and trusting relationship with the child;
- Using consistent daily routines in which the child is fully involved;
- Providing the child with cues and so that he can learn to anticipate what is going to happen;
- Giving the child opportunities to have some control over his or her environment (Gleason, 2002).

Coupe and Goldbart (1998) distinguishes that in order to have an intentional communication, the deafblind child must want to communicate, to have something to communicate about to somebody and to realize that his message has different consequences on the behavior, information and attitudes in the environment.

The idea that must shape the whole intervention process is that all babies communicate and it is through communication that relationships are formed and sustained.

McInnes and Treffry (1983) distinguish nine stages of interaction that the deafblind children go through in the early stages of developing communication. These are:

1. The child will actively resist the activity. He will turn away, scream, cry or hit.
2. The child will passively resist. This means that he refuses to cooperate but does not do any of the behaviors mentioned above.
3. Tolerates interaction co-actively. He tolerates the introduction of new activities and a short participation because of the trusting relationship with the adult and not the activity itself.
4. Co-operates passively. This is the transition between co-active and co-operative levels.

5. Enjoys activity. The response to the activity is because of the activity itself and not because of the relationship with the adult. He is relaxed and shows understanding and interest in the activity, but he is still passive.

6. Responds co-operatively. The child follows the adult's lead with little direction or need for encouragement.

7. Leads adult through activity. Contact is needed but it is minimal. The child is anticipating sequences and directing actions to a successful conclusion.

8. Imitation. The child goes through the sequence of actions independently after being told or shown what to do. The child can also develop problem solving skills.

9. Initiation. Child initiates activity independently.

Children with deafblindness can communicate at various levels. Sometimes interaction is at a basic level, but this can add enormously to their quality of life, building up relationships with family and others. Others become highly competent users of language in its different forms.

In early months of life, communication is based on body contact, mutual caressing, moving together, gazing and exploring faces, listening and vocal play. During this time, the child is learning to do things together with another person, to respond to prompts and cues, to react contingently, that is to say, with relevance to what has just occurred, to prove a contingent response, to take turns. It is the first established and successful dialogue, "you and me" that determine the development of early communication skills.

Nafstad and Rodbroe (1999) emphasize what they call co-regulation. Communication begins with the child and carer having an emotional involvement in each other. The synchrony or shared rhythm, the affective attunement (sensitivity to each other's emotional state or mood) and the regulation of tension (following the child's pace and giving time for responses) are all important to the success of interaction through careful negotiation or co-regulation of social interaction, of proximity and distance, and exploration, to develop shared communication behaviours. It is about shared experiences and vocabulary of signs, cues, signals, movements, sounds, gestures. Before children comprehend the meaning of words, they use a variety of contextual cues to determine a response strategy and thus they may appear as if they comprehend specific linguistic information (Snell, Brown apud Chapman, 1978, Miller and Paul, 1995).

Bates and associates (1979) identified three stages in the development of communication. From birth, the infant is in the "perlocutionary" stage. The child's behavior has a communicative function, but it is not produced with intention. Communication is preintentional. The adult is the one who interprets the behavior as if it were intentional. At about 9 months of age, most children move to the "illocutionary" stage and begin to use preverbal gestures and sounds to communicate intentionally with the purpose to affect the behavior of others. At about 13 months of age the child progresses to the "locutionary" stage and begins

to construct linguistic propositions while communicating intentionally with referential words (Snell, Brown, 2000). These stages can be applied to the development of communication at deafblind individuals as well, though we may notice a delay of their occurrence because of the existing disabilities. Many deafblind children remain to a non-symbolic communication until they are older and some may never use language to communicate.

Stephenson and Linfoot (1996) neatly summarize the criteria that Bates and others have described for communicative acts to be deemed intentional:

- Non-verbal behaviors coordinating object –directed actions;
- Persistence until the inferred goal is achieved;
- Repair, that is repetition or modification of strategies if the correct goal is not achieved;
- Satisfaction on achievement of inferred goal. (Coupe, Goldbart, 1998).

Rowland and Stremel-Campbell (1987) establish the following levels in communication development:

Level 1. **Pre-intentional behavior**: pre-intentional or reflexive behavior that expresses the state of the child. State, like hungry, wet, etc. is interpreted by the observer.

Level 2. **Intentional behavior**: the behavior is intentional, but is not intentionally communicative. Behavior functions to affect observer's behavior since observer infers intent.

Level 3. **Non-conventional presymbolic communication**: non-conventional gestures are used with intent, to affect observer's behavior.

Level 4. **Conventional presymbolic communication**: conventional gestures are used with intent of affecting observer's behavior.

Level 5. **Concrete symbolic communication**: limited use of concrete (iconic) symbols to represent environmental entities. There is a one to one correspondence between symbol and referent.

Level 6. **Abstract symbolic communication**: limited use of abstract (arbitrary) symbols to represent environmental entities. Symbols are used singly.

Level 7. **Formal symbolic communication (language)**: rule bound use of arbitrary symbol system. There are ordered combinations of two or more symbols according to syntactic rules.

Vonen and Nafstad (1999) point out that a "distinctive feature of human communication is the dominance of sharing". Creating the optimal environments leads to spontaneous non-linguistic communication.

Deafblind children are often expected to use only speech or sign language. But there are a wide range of systems of communication that are accessible and make communication efficient and fluent. Deafblind children can use also body signs, gestures, movements, signals, objects in expressing their interests and needs. It is the adult who must infer and negotiate on the meaning. The deafblind child,

and not only, must surpass every stage so that he or she can develop language as formal symbolic communication. Every stage has its rhythm and specificity.

It is mistake of the intervener/ partner of conversation to insist in using a specific system that he thinks it is the best. The child has to have the freedom to use whatever system of communication he thinks is the best for expressing himself.

Progress in communication will enable children to express themselves more flexibly, to have a greater access to events and information, to have a sense of anticipation to what it is going to happen, to be more successful in overcoming isolation and include in the life of the community (Heather Murdoch, 1995).

Communication is crucial and for the deafblind child it includes a variety of ways in which a person is connected to his or her environment and to the fabric of life. Communication is of great value at whatever level it can be developed (Miles, Riggio, 1999). Communication improves the quality of life, has a huge impact on child's personality, his or her self- esteem and identity of "who am I?" in this world, assures inclusion in family and community and enables access to information. Thus the deafblind child realizes that he can make a difference, he can influence and determine changes in the behavior, attitudes and information in the environment.

Siegel-Causey and Guess (1989) identify five aspects to consider when developing strategies to support a child's development at the early levels:

Nurturance: establishing a bond of mutual interest, attention and care with the child, with a very positive and affectionate relationship, showing respect for the child's activities.

Sensitivity: responding to the needs, interests and awareness of the child, trying to understand the child's affective behaviors and interpret them in a meaningful way.

Providing opportunities: giving time for the child to elaborate a response, respecting his rhythm of playing and carrying out an activity, leaving time for the child to process what is happening, think and participate, develop routines so that the child can anticipate and control, and recognize what is expected.

Sequencing experiences: using predictable and repeatable sequences that give the child the chance to learn patterns, concepts, as time concepts, roles.

Using movement: observing the child's movement, encourage them in communication, tuning in to playing with the hands or body in different motor activities or games (Gibbons, 2003).

Linda Alsop and associates (2002) propose as practical strategies to encourage the development of early information the following:

1. Identify the child's communicative behaviors and communication levels. It is very important that through observation and collaboration with parents to identify the behavior that the child uses in expressive and receptive communication. The communicative behavior is interpreted and confirmed by the adult. This way the intervention becomes efficient and it is appropriate to the child's needs.

2. Build on the child's strengths and preferences. The process of communication can be compared with the construction of a house. Every level is build on the previous one, every brick in the line matters. For a successful communication each of the child's ability matters. The selected methods for encouraging the child's communication should be based on his abilities. Observations must be made about the child's responses to anticipatory cues, speech and signs. The child should also be motivated to communicate, so the interveners must know about the child's preferences, interests, favorite activities, objects and people.

3. Identify and develop predictable routines. The routines, the predictable activities, for example meals, dressing, playing provide natural contexts for communication. Through repeated experiences in these daily activities, the children will develop an understanding of the anticipatory cues and the signed/ and or spoken words that occur in these activities. This way the child can ask for the activity, sequences of it, to continue or to stop it. These predictable routines have clear beginnings and ends.

4. Develop, use and expand turn-taking games. The turn- taking games are the precursors to conversation. Through these the children learn the rules of conversation, how to respond and how to initiate. It is about me and you, me and again you. Imitating the child's behavior or any kind of initiative is another strategy for encouraging the child to tune in turn-taking games. Children are likely to imitate a behavior that they already produce. Over time the adult can gradually modify the rhythm or some aspect of the activity. There is also the concept of the progressively matched turn-taking, in which the adult imitates the child's behavior and adds a bit more information. The adult confirms the child's behavior and offers also a model for the next step. Adding novelty to the routine may cause him to try to initiate the predicted or ask for an object needed to begin the activity. The child learns that his actions can impact other people, and that people in his environment respond to his intentional behavior. He can start conversations as well as responding to others' initiatives.

5. Develop and use interrupted routines to encourage the child's requests. These routines encourage the child to ask for the activity to continue, they develop concepts and communication skills. It is about offering pauses, respecting the child's pace and follow his or her lead. It is also about anticipation and control, about self- esteem and self- identity.

Through play a child can learn to trust and anticipate that certain things will occur, how to make things happen, about ways to ask for help, ask for more, ask to be done, about the power of making choices, it allows a better understanding of the world and that communication has many different forms.

Although Dr Van Dijk (1985) described conversation as the goal for the deafblind child, the non-verbal conversations are the foundation for learning language and a variety of other skills. As children spend more time interacting with other people, they naturally have more opportunities to learn from them. If conversation and interaction are priorities, the child will have many opportunities to learn new words, signs, symbols and functional living skills.

Miles and Riggio (1999) suggest that we should emphasize the development of play, exploration and interaction. Within the context of play, it should be possible to incorporate opportunities for the development of skills in a natural way.

In conclusion, it is necessary to consider how to foster communication in everyday settings, at home, in social and educational centers. In moving towards the communication of semantic roles and the eventual use and understanding of single words, it is important to provide input to help learners encode their cognitive experiences. But there is communication before speech, the early stages that are very important to consider and intervene because they represent the basic of communication that must not be neglected. In these stages the concepts of dialogue, initiation, feed-back, intentionality, control and anticipation are formed.

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THE CHARACTERISTICS OF PSYCHOMOTOR DEVELOPMENT AND LANGUAGE RETARDATION THERAPY

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ABSTRACT. This study reveals the relationship between the characteristics of psychomotor development and speech delay. The fundamental components of psychomotricity, the body scheme and the basic motor coordination influence the more complex structuralisation of functions such as psychomotor coordination and organization of psychomotor actions. The maturity of these functions is a prerequisite for the success of the reading-writing learning processes.

1. Evolution and prognosis in language retardation therapy

The evolution differs according to the clinical type and etiology. "Language debility" is characterized by persistance and resistance to therapy.

If we don't take into consideration the fallowing syndrome "the language dizability", evolution is a favorabile one. The clinical type that goes hand in hand with encephalopaty effects develops according to their severity or to the degree in wich they imply different language cerebral structures. In the ccase of preschool children the development is slow in this case (clinical type), but towards the end of this period they become more obvious, thus speaking limitation and the dyslalical aspect of pronunciation disappears after the first year of attending school. Sometimes it is necesary to be delayed the schooling with one year, period during which the speech terapy and the logopedical intervention will put away the symptoms.

On the contrary the evolution is quick in the somatical and psychogenic forms. The observations on the children that had not any verbal models (abandoned children or children brought up in collectivities that couldn't ensure the necessary medico-pedagogical qualifed assistance or children brought up by deaf-mute parents) proved that in the cases where the cerebral lesions or a native disability are absent, the children learn to speak , learn speech even after the age of 6,5 years old and they can reach quickly a perfectly normal (regular) verbal intelligence level, an ordinary brain learn to speak anytime, in order words". This assertion belongs to G.E. Arnold (Bloom, 1994) and it is true in general- there are favorabile periods of time for the language aqusition so that except them the language impairment is never retrieved totally.

To sum up what was established in development, the prognosis is, in general, a favorable one (good), the delay disappears in time, in the most cases without any residual simptomatology. But the duration varies according to etiology and the clinical form. But the best prognosis can be offered to the somatical and "idiopatical" cases (simple retardation), the prognosis in the sechelar forms varies, according to the degree and the lesion localization.

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In general towards the age 6-7 years old it can be identified a qualitative leap and is to be underlined the greater receptivity to the logopedical treatment and to the medico-pedagogical intervention at this age. The psychogenic forms are not always the simpler one and the treatment frequently faces problems that could't be foreseen in the beginning.

In general, is to be adopted an abeyance attitude towads a minor or medium delaly, and only sometimes, the physician and the parent are to consider the language non-development a worring simptom. If we take into consideration only two of the language system coordonates, the necessity of an early intervention becomes a terapeutical relevant necessity.

Verbal communication is to be found at the basis of socialization process and knowing one- the most important elements of the development process of human personality.

If communication is not organized according to the developmental stages of the child, this leads to the delaying of his psycho-social development.

2. The logopedical terapy of language retard

2.1. The importance of the early intervention

During the last years a great importance was given to the valorizing of the early intervention. The chid's benefit is obvious: the sooner the developmental problems are identifed, the quicker the necessary aspects of intervention are put into practice. Many parents hope that their children will recuperate the developmental language impaierment until the schooling time, but in reality things aren't like that. Many children will recuperate the developmental language impairment until the schooling time, but in reality things aren't like that. Many children who benefit from an early intervention, still need treatment even after they go to the elementary school (Rapin, 1996; Beitchman, Cohen, Konstantares and Tannock, 1996, apud Dunlap, 1997).

If the developmental problems have a neurological basis, the early intervention benefit by the relativ plasticity of the immature brain (the flexibility and the ability to learn) in order to develop compensatory strategies for learning and communication (Warren, Reichle, 1992, apud Shore, 1995).

2.2 The psycho- terapeutical intervention

This has to come before any other procedure and to be put into practice along the therapy. Its most important components are:

- stabilizing or restabilizing the neuro-psychic and emotional child's equilibrium;
- eliminating the conflicts through deleting the existent psycho-emotional problems active in the social relationships, *the most harmful problem is the child fixation on the communication process either as a result of the parent's, teacher's insistance, or as a result of isolation;*
- the tonus intensification and varying the emotional relationships;

- the increasing of the motivation level for verbal communication in playing, in the intrafamilial relationships, in relationships with strangers;
- stimulating the interest and the happiness of knowing by using toys, adequated to age and abilities and of exploring new places day by day;
- the free drawing by using different colors, painting, modelling (endotherapy, the occupational therapy);
- musical therapy and rhytmical-therapy (melotherapy);

The psycho-linquistical basis of the stimulating organizing and developmental actions the child's language: *the stimulating actions of the language development benefit from many techniques, ways, activity forms,* that pull together in an organized and deliberate almost all the aspects of the process of comunication, process in which a child usually attends.

2.3. The logopedical complex therapy

For the linguistical stimulation can be used a great number of techniques and intervention methods.

a) Naturalistic teaching is a type of intervention that takes place in familiar places, such as the kindergarden or at home. This method is used during the daily program instead of an the individual therapy session. Other features of this technique: the communication theme is chosen by the child and it fallows his interest. Communication is mantained by using natural reinforcement (comportamentalist method) (Yoder, 1995, apud Rondal, 1999). Two examples of this method of intervention are: "the Milien method" and "the responsive interactions method".

The Milien method is a method according to which the adults (parents and teachers) organize deliberately the enviroment to stimulate the child's verbal communication (Kaiser, Hesner, 1994, apud Rondal, 1999)).

The adult pays attention to the child's interests and stimulates his speech by giving him models and reinforcements for his answers.

The responsive interaction (petitioner one) is a way of natural learning. This technique underlines the development of an interractioning style that promotes the alternation in initiating the comunication between the child and the adult (Mahony, Nevlle- Smith, 1996, apud Rondal, 1999)).

b) The parent's role in language and speech terapy

The parents can be prepared, tought with the speech therapist's helph to support their children that have a language impairment, by offering natural stimulations for the oral language during the daily activities. In general, the parents are prepared to wait and to stimulate taking the first step in communication by their children, to give them the chance to manage the conversation and to comment upon, to offer explanation on the children's interests by using simple but complete sentences. The parents are given ways in which they can reach certain aims by using non-directive conversation and pozitive reinforcements (Coggins, 1994; Hancock and Kaiser, 1996, apud Lerner, J, 1997).

c) Behaviorist techniques in the language retardation therapy

The official techniques for language development comprise behavioristical strategies and strategies for direct learning (Cole, 1995; Linder, 1993, apud O'Connell, 1997). These consist on reinforcements, modelling, support for giving the corect answer, giving some clews, suggestions.

For instance, the clews are offered when a child comes across problems in imitating an answer, the way it also happens in the interventions of aphasy (it is given the first letter from the word or it is shown insistently the named object).

The critics for this technique refers to the fact that the new aquisition in language (speech) will be spread in new situations with difficuly. The therapy is often organized in an office .

d) The mediated intervention by the same age mates..

The technique imply teaching the mates with normally developed language in order to help their mates that come across difficulties in the language development to communicate as much as possible during the games. The children are tought to use communicative strategies such as: establishing the eye contact, making the first step during the game and in communication, stimulating the initiative, the description of the game, asking for the classifications (Bergen, 1994). This method gives models to be learnt a new social and communicative competence. It can also be easily generalized from the classroom to the playground (Goldstein and Strain, 1994, apud Buchanan, 1997)).

e) The intervention in the class

This method is interested in language valorization in preschool (Cook, Tessier, Klein, 1996; Rice, 1995, apud, Lerner, 1997).

It asks for the use of language when children interact. This strategy is interestd in the child’s wish to play with the others, in child’s wish to describe his behaviour during the game and to verbally express his intentions. The teacher stimulates the children to communicate during the game.

f) The use of the language to ask for help

This strategy asks the teacher to offer help the child so that the child can obtain the wanted toy, the adult reinforces the child’s trying to communicate by giving him the toy after the child had verbally asked it.

g) The use of the language for the description of the activities

The techniques asks the teacher to be an active listener. For instance, when the child speacks about a recent event, the teacher carefully listen to him and stimulates him to tell as many details as possible (Buchanan, M. 1997).

Results

There have been investigated two groups of children. The first group included children with speech delay, who attended kindergartens in Cluj-Napoca during the academic year of 2004-2005. The second group consisted of 30 children attending the upper kindergarten level and showing an age-related level of speech development.

Following the comparative analysis of the development levels reached by the two groups of subjects, the Mann-Withney Test revealed significant differences between the development levels attained by speech delayed subjects and those showing a normal speech development in all investigated areas.

Table I.

Comparative study between the development levels reached by children with delayed speech and those showing a normally developed speech, using the Webster Scale

	ANR	CIT	CLA	CTA	CUN	EXP	FUN	IND	INT	MAT	OTG	REC	SCM	SCR
Mann-Withney Test	129	52.5	2.50	10.0	199	.000	1.50	108	12.0	70.0	62.0	12.0	180	177
Significance level	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.286	.267

a. Variable: Group

Legend: NRO – Number Occurrence; REA – Reading; CLA – Clarity of Speech; ACT – Attention Control; KNO – Knowledge Core; EXP – Expressive Language; FUN – Pragmatic Language: Functional Communication; SKI – Multiple Skills; INT – Interactions: Preverbal Strategies of Communication; MAT – Mathematical Concepts; OTG – Orthography; REC – Receptive Language; HWR – Hand Writing; WRI – Writing.

The result analysis obtained by using the Mann-Withney Test reveals highly significant differences ($p<.01$) regarding communication and learning strategies in the children of the two groups, less so in the "Writing" and "Hand Writing" competence areas, in which there were no significant differences between the development levels reached by the children of the two groups.

In order to analyze each competence area, we will examine the following charts showing the median (the index of central tendency, which is used for processing asymmetric distributions) of the development levels for the two groups.

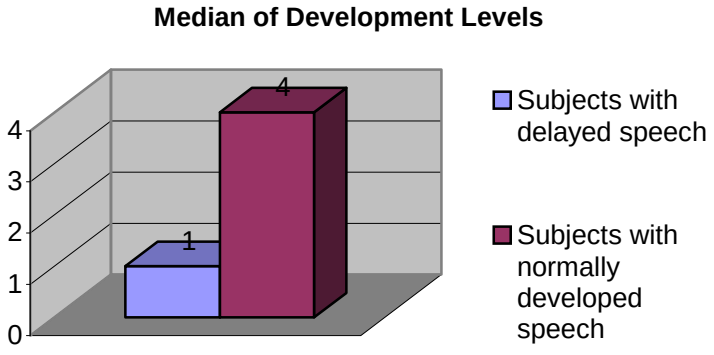

Fig. 1. Number Occurrence

The next area to be analyzed is *expressive speech*. Especially here one can notice significant differences between the median of the levels concerning speech delayed children and the median of the levels assigned to the other group.

As chart no. 6 shows, the subjects of the first group correspond mainly to levels 1 and 2, while the subjects of the other group generally correspond to level 4. This means that speech delayed children use combinations consisting of two elements (subject and predicate), negative forms consisting of two elements, adjectives accompanying nouns, are able to formulate commands consisting of two elements, of course, all of these in a simplified manner, which is inappropriate for their chronological age.

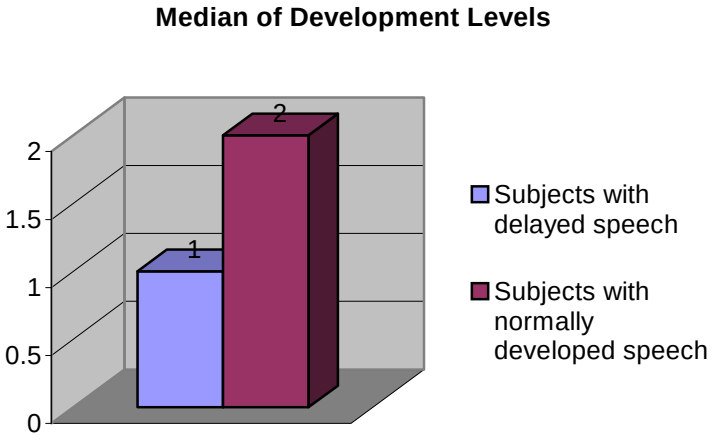

Fig. 2. Expressive Speech

Children with a normally developed speech connect sentences together in order to form complex statements, interchange the subject-predicate-order for elaborating questions, use a series of structures such as plurals and pronouns, and are capable of referring even to a context of passed events. These differences become even more significant given the fact that the children of the first group are aged between 6 and 9 years, whereas the subjects of the second group are between 6 and 7 years old.

The competence area of *functional speech* also reveals significant differences between the two groups. The histogram of the development level medians shows that the median of the levels corresponding to the speech delayed children's group is 2, while for the other group, the median level is 4. The first group is characterized by a series of particular aspects: It produces various attention drawing signals, it exhibits signalizing reactions and answers that are adapted to familiar routine as well as an associated language or signs, it directs and manipulates adults, it uses

more manners of initiating a conversation, including questions, interventions containing a message, it participates as a talker and receptor in the small group activity with children or familiar adults. In the mean time the subjects of the other group are able to sustain conversations longer than 10 replicas with other children or adults outside the familiar context.

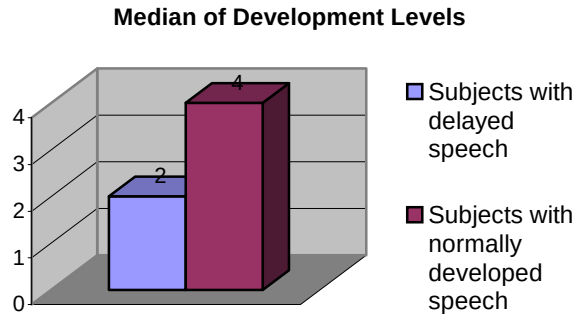

Fig. 3. Functional Speech

For the following investigated areas, the Mann-Withney Test also revealed significant differences between the ranks of the development levels corresponding to the two groups of subjects.

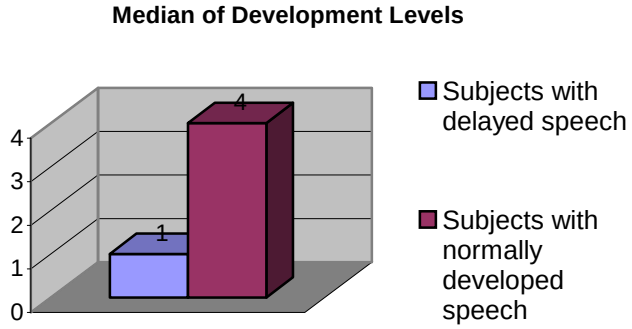

Fig. 4. Interactions

According to chart no. 8, the median of the development level corresponding to the speech delayed children is 1. These children enjoy mutual attention, including eye contact with others, enjoy playing with other children or adults, they like to split toys with others and play with the whole group, react to pauses made by adults at the end of replicas, participate in instructional and educational activities and in sequential games together with other children, and they enjoy role playing games.

The children in the group without speech impairments, who generally correspond to level 4, voluntary participate in imaginative games of the whole group, they can carry on well-known routines while focusing on other persons or events, and they initiate dialogues by using a whole range of functions: interaction sustaining, exploring, asking and answering questions, making comments, and fantasizing.

The application of the nonparametric correlation method (Spearman coefficient) reveals a highly significant correlation at a level p<.01 between the results of the three tests (Bender A, Frostig, Reversal) obtained in the subjects of the two groups, as shown in the following table:

Table II.

Correlation between the results of the tests (Bender A, Frostig, Reversal

Nonparametric Correlation

			BENDERA	FROSTIG	REVERSAL
Spearman coefficient	Correlation coefficient	BENDERA	1,000	,722**	-,679**
		FROSTIG	,722**	1,000	-,534**
		REVERSAL	-,679**	-,534**	1,000
	Significance level	BENDERA	.	,000	,000
		FROSTIG	,000	.	,000
		REVERSAL	,000	,000	.

** The correlation is highly significant at the .01 level.

A highly significant correlation has been noticed also between the results obtained in all tests by the subjects of the speech delayed group.

Table III.

Correlation between the results obtained in all tests by the subjects of the speech delayed group.

Nonparametric Correlation

Group				BENDERA	FROSTIG	REVERSAL
delayed speech subjects	Spearman coefficient	Correlation coefficient	BENDERA	1,000	,538**	-.531**
			FROSTIG	.531**	1,000	-,497**
			REVERSAL		,497**	1,000
		Significance level	BENDERA	.	,002	,003
			FROSTIG	,002	.	,005
			REVERSAL	,003	,005	.

** The correlation is highly significant at the .01 level.

The higher incidence of speech impairments in left-handed subjects and in those with mixed laterality, as well as the relation between laterality and speech development in children turned the examination of laterality into an important issue of speech therapy.

The examination of laterality has led to the following results in both groups:

- In the group showing normally developed speech only 3 subjects had left dominance, the rest of 27 had right dominance.
- In the group with speech delay, 20 subjects had right dominance, 7 had left dominance, 2 showed a still unconsolidated dominance, and one subject showed cross dominance.

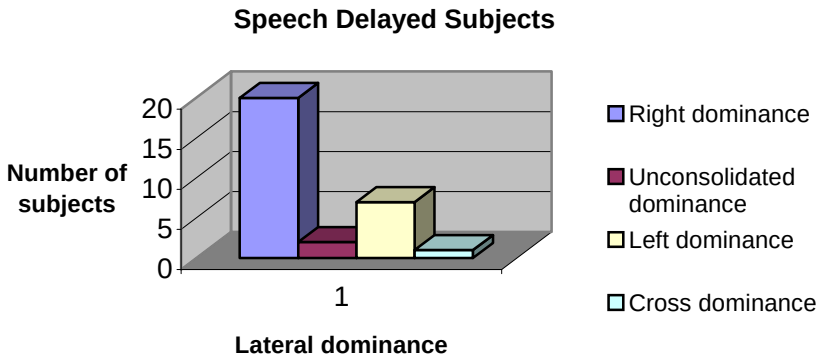

Fig. 5. Lateral dominance

The relation between speech delay on one hand and left-handedness, cross dominance and unconsolidated dominance on the other has been drawing the attention of researchers for a long time, of course, due to the high frequency of their association. There are authors who believe that speech disability in a left-handed subject does not necessarily mean that he or she also has a motor disability, which could explain his or her speech deficit.

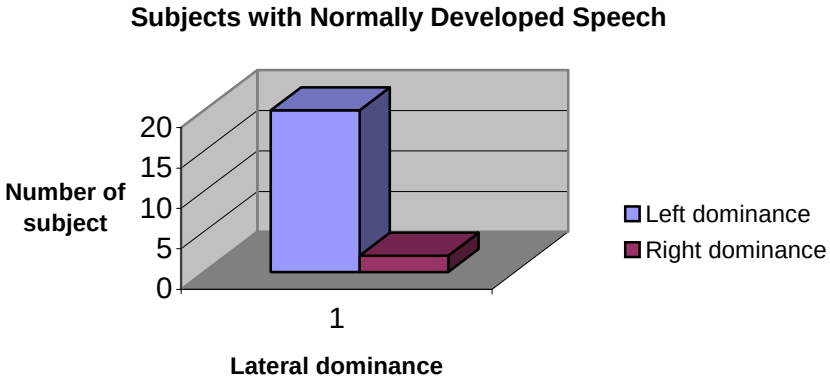

Fig. 6. Lateral dominance

Generally left-handed subjects have difficulties in adapting to the instruments of our world that has been projected and built for right-handed, but for the movements of the bilaterally implicated organs participating in speech it is of no importance which hemisphere is thes dominant one. The conflict appears either in case of incomplete left dominance, in case of cross dominance, or in the "corrected" left-handedness, all these cases being frequently associated with speech impairments. C. Păunescu considers that in the case of speech, dominance problems cannot explain the speech delay that appears before a dominance conflict or a laterality "correction" occurs. But the possibility exists that both the speech delay and the left hand-preference to be the effects of cerebral lesions, and therefore to have the status of a micro-sequel, a fact confirmed by the data obtained from the medical records of the children, most of the speech delayed children presenting with sequels of encephalopathy.

Usually the body scheme is the starting point for the accumulation of the whole knowledge regarding movement and space. The body scheme is elaborated due to the automatisms and afferences that function beyond consciousness. The body scheme, i.e. the simplified model not so much of the form, but of the functions and the relation between different parts of the body is poor, incompletely interiorized and consolidated in the speech-delayed children considered in this study, taking into account especially their chronological age, compared to the children showing normally developed speech, who have proven a sound knowledge of the functions and positions of the various body parts.

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STUDIA UNIVERSITATIS BABEŞ-BOLYAI, PSYCHOLOGIA-PAEDAGOGIA, LI, 1, 2006

ORGANIZING A MATH PROJECTS ACTIVITY

IOANA MAGDAŞ

ABSTRACT. In the last few decades we assist at a change of the teachers role in the teaching –learning process. The teacher becomes a guide for students so that students have to be taught how to select and use, in the most effective way, the information to develop their personality. In this context the project method has a very important role. The students will learn to access different sources, to select and present their own research. In this article will be presented few aspects about organization, implementation, presentation formats and assessment of a math projects activity.

In the last few years we assist at a renovation process. This is a worldwide process thanks to technological and social evolution. Few decades ago, teacher was the most important source of information for students. In that period, the students' knowledge access was limited and selected by teacher. In our days, students have access at informations by using different ways: TV, radio, Internet, libraries, books, reviews, etc. Every 18 to 22 months, the information quantity is doubled. It will suggest the need for educators to reexamine the way they think about teaching and learning and will propose a new paradigm in which the role of the teacher as well as the role of the students it is changed. Students have to be taught how to select and use, in the most effective way, the information to develop their personality.

In this context the project method has a very important role. The students will learn to access different sources, to select and present their own research. Teachers who incorporate projects into their curriculum often report positive changes in students' attitudes to mathematics. In the next paragraphs we will present few aspects about organization, implementation, presentation formats and assesment of a math projects activity.

Organization is the key to having a successful and enjoyable experience with projects. It is crucial to have completely mapped out ahead of time the goals, time frames, and expectations for the assignment. Here are some issues to consider while planning that will help teacher and students alike have a positive experience.

1.Topic

The place to begin is with the subject matter. Teacher can decide the topic of projects or students may have the opportunity to choose it. If you prefer to allow students to choose their own topic, you may want to offer a list of sample titles, which indicates the degree of specificity that you desire. To give students a general

bibliography for each topic you indicate isn't compulsory but will be a begining point for students. Working with a teacher from another subject is an excelent way to generate student interest in projects. When mathematics teachers complete a list of topics he/she has to know the possible fields of sellections. These categories are:

- *Complements of mathematics*: this category includes topics or units from the curriculum who need to be extended or to study thoroughtly;

- *Real-world applications/ interdisciplinary topics*: this category includes a topic in any field and documenting how mathematics is used in that field;

- *Artistic design*: this category includes string art, tessellations, graphing design, scale drawing, scale model, constructions;

- *Original games*: this category includes the design of an original game, complete with rules, instructions, playing pieces, board, etc.

Below is a list of possible math project topics:

Algebra	**Geometry**	**Interdisciplinary topics**
Abacus	Angle Trisection Problem	Art and geometry
Arithmetic Progressions	Area Formulas and	Astronomy and Mathematics
Geometric Progressions	Calculations	Computers and Mathematics
Averages	Four Color Problem	Music and Mathematics
Fibonacci sequence	Geometric Constructions	Math in Nature
Functions	Geometric	Famous Mathematicians
Patterns	Transformations	Fractals
Combinations and	Golden Section	Paper Folding and Origami
Permutations	Nine-point Circle	Math games
Irrational Numbers	Pythagorean Theorem	Symmetry
Pi	Conics	
	Non-Euclidean Geometry	

2. Purpose

There are two types of objectives a project can has:

- *Cognitive goals*: that means to put students in a learning situation. The project provides math knowledge enrichment, and is a challenge for student.

- *Social goals*: that means to put students in a cooperative learning situation or interactive relationships.

3. Time frame

As an organizer, teacher has to think about both the teacher' s time and students' time. The students have to work at the project both in class and home. The teacher has to plan a policy of giving extensions and assigning penalties for late projects.

4. Guiding the Project Activity

Students work best, and are most successful at meeting the teacher expectations, when they have ample structure feedback. Teacher has to support students to succed. That's why the teacher will provide students next documents:

- *Expectation Form* (see Appendix1): the teacher must give this form to the class on the first day of discussion about projects. It should contain:
  - A detailed description of the assignment
  - The areas of constraint ("your project must have...")
  - The areas of flexibility (" you are free to choose...")
  - The aspects to be evaluated, broken down by points or procentages
  - The proportion of the project's grade to the semester grade
- *InitialReaction form* (see Appendix 2): after presenting the expectations of the project, the teacher ask students about:
  - Possible topics
  - Possible methods of presentation
  - Ways to make their project original and entertaining
  - Preferred partners
  - Any fears or concerns

The students will return papers next day(s). This helps the students to attune their thinking with the teacher's objectives for the project.

- *Feedback form*: the teacher will study students'proposal and will decide: the groups of work, the assignment for each student, the topic for each group, and give them a short bibliography.
- *Formal-Proposal Form* (see Appendix 3): after students have received the teacher's feedback on their ideas, they need time to do some research. Then they have to turn in their formal proposal, which should include:
  - Topic
  - Method of presentation
  - Outline
  - Bibliography

After an amount of resonable time, teacher has to organize individual or group meeting to find in what stage of work and the students are, and what needs they have. The students have to:

- Explain which parts are complete and which ones they are still working
- Ask for guidance on issues with which they are having trouble
- Use the expectations form to assess their project as it currently stands so that they can troubleshoot any glaring deficiencies while still have time to repair them

5. Presentation formats

Few decades ago, the math projects were synonymous with a research paper. Now there are other possibilities to display knowledge gained through the research process. These new presentation formats are sometimes more successful in capturing students' interest and motivating them to excel. For instance: video, video projector presentation, skit or demonstrations, photo album, notebooks, graphics portofolio, posters, charts, models, business presentation. Besides the presentation format, the students have to type a report. The report contains (see Appendix 1):

- *Title page*: On the first page has to appear: title of the project, students' name, the date and math teacher's name

- *Introduction*:

Paragraph one- the students tell what the project is about, the questions they are trying to answer, and why he/she chose this project.

Paragraph two- the students gives some background information related to the project, which they learn through the research. They may include some previously known information as well.

- *Contents*: The students present the mathematical ideas, problems, and/or principles being investigated in a detalied form

- *Material list* (if appropriate): Is a list with the name, quantity, size, color and all pertinent materials the students used in constructing and developing the project.

- *Procedure*: The detailed steps of the procedures the students used in doing the project are presented, so that anyone who wishes to repeat the project should be able to follow those directions.

- *Results/ Conclusions*: In this paragraph the students will sumarize and present the results of the projects. The new questions, some improvements the project suggest, are also presented.

- *Bibliography/Acknowledgements*: list all books, journals, magazines, newspapers, Internet sites, etc. that help students to write the projects. Also include acknowledgements of anyone the students like to thank for their help with project.

- *School to Work Activity/Explanation* (if appropriate): Here the students may include an explanation how the topic applies to a career, job or in real-life situations.

6. Evaluation/Autoevaluation

It is important for the students to understand the grading criteria for the project from the first day, so that they can design their project to meet the teacher's expectations. Although the teacher will obviously has many mathematical components specific to the project he/she assigned, there are a few general categories the teacher may also want to consider including:

- *Social behavior*: if students work in a group, it is often appropriate to base part of their individual grade on their effectiveness in working with others and their contribution to the team project

- *Bibliography*: is the bibliography relevant and varied?

- *Errors*: is the scientific content it is corectly and clear explained?

- *Appearance*: given the importance of presentation skills in the business world that awaits the students, it is very important that they to understand that appearance is often as critical as substance. The teacher has to make them aware of neatness, grammar correctness, technology used, and oral presentation skills

- *Creativity and Effort*: the teacher has to measure if the project is innovative, or the students did the minimum necesary to earn an acceptable grade. The teacher has to give extra credit for projects that evidence original thought and effort above and beyond the expected.

An evaluation scale will be included in the expectation form. (see Appendix 1)

Appendix 1. Sample Expectation Form (Poster- High School Probability and Statistics Class)

Dear students,

This letter is intended to give you some information concerning a math projects activity we are going to do in the next couple of weeks.

What

The math project you will be working on for the next two weeks is titled "Gambling: a great way to lose money" and will be worth one test grade. In class we did an extremely detailed theoretical study of probabilities and counting techniques. At the end of these chapters I propose you to do an analysis of the odds involved in the casino game craps. You will learn why this game always favours the house and how much money the casino can expect to make every time someone plays. Your assignment is to research any game of chance and summarize your findings on a poster. One caution: it is easier to calculate the probabilities involved in single-round games (like spinning a rooulette wheel or buying a lottery ticket) than it is to analyze continuous draw card games (like blackjack). Please keep this in mind when selecting your game.

How

You will be allowed to work with one or two partners of your own choosing. The school librarian has on reserve a stack of books and magazines that contain relevant articles, and should you require greater depth, and also you can use the Internet to conduct an on-line search. Once you have decided on a specific topic, clear it with me so that I can make sure no else have the same topic.

- Poster should contain the following information:

- origins of the game, rules for playing it, payoffs and odds

- societal impact research. Attach to your poster a newspaper or magazine article telling the story of someone who has ruined his or her life because of compulsing gambling. Include at the bottom the name and date of source.

➢ In addition to the poster, each team will give ten minutes oral presentation on their findings. I will assign two school hours for this activity.

➢ A detailed two-page typed explanation must accompany the poster and include the following: title page, introduction, contents, material list (if applicable), procedure (game research), results/ conclusions, bibliography/ acknowledgements and school to work explanation.

Grading Criteria

Category	Excelent	Acceptable	Poor
Poster 50 pts.	10 8	6 4	2 0
Accuracy	Format acceptable, Scientifical correct	Format acceptable Few scientifical Mistakes	Format unacceptable A lot of mistakes
Neatness	Carefully produced Professional work	Some care taken Somewhat professional	Sloppy Unproffessional work
Creativity and effort	Very creative Work hard	Somewhat creative Medium Work	Not creative Little work
Appearance	Pleasing to the eye Colorful Mixed media used	Somewhat pleasing to the eye Attractive	Not pleasing to the eye Not attractive
Organization	Logical arrangements on the board Very easy to follow	Difficult to follow Some sections out of Order	Unable to follow Many sections out of Order
Written Report 30 pts.	5 4	3 2	1 0
Title Page	All information included Correct format	Missing information Incorrect format	Missing
Introduction and Contents	All paragraphs included and adequately discussed	Missing one paragraph and/or paragraphs not adequately discussed	Missing, poorly discussed
Material List and Procedure	All materials and all procedure steps included	Missing some materials Detail is lacking, some steps are missing	Missing , very little detail

Results/ Conclusion	Appropriate data reported, written descriptions included	Some data reported, written descriptions included	Key data not reported and/or written descriptions are missing
Bibliography/ Acknowledgements	Present, corect form	Present, incorect form	Missing
School to work Activity/Explanation	Included, clear	Included, but not clear	Missing
Presentation 10 pts.	10 8 Atractive, Clear, Accurate, Concise	6 4 Not very Atractive, Clear, Accurate, Concise	2 0 Unable to follow the explanations, vague
Social Behavior 10 pts.	10 8 Effective work Good contribution	6 4 Medium effective work Medium contribution	2 0 Not effective work Poor contribution

Circle the number best indicates the score for the appropriate category.

Appendix 2: Initial Reaction Form (for students)

1. Please list your top three choices for partner on this project:

_____
_____
_____
_____

2. Please list your top two favorite ideas/ topics for this project:

_____
_____
_____

3. Please list your top two preferred presentation formats (using a video, video projector, poster, skit, paper, etc.)*

_____
_____
_____

4. Why do you feel your first choice presentation format is the best way of presenting what you know about this topic?*

_____
_____
_____

5. What ideas does your team have for making this project unique?

_____
_____
_____
_____

6. Do you have any fears or concernes about your team, about your ability to fulfill the expectations for this assignment, or about anything else having to do with the project? If so please briefly describe them here. This information will be kept confidential.

_____
_____
_____
_____

* if appropriate

Appendix 3: Formal Proposal Form (for students)

Our topic:

Our mode of presentation:

Team members and responsabilities:

NAME	ASSIGNMENT
_____	_____
_____	_____
_____	_____

This form is due _____ at the end of class. Please attach the following items to this form:

- Outline of your project
- Bibliography
- A briefly decription of what you intend to do in this project

Date: Signatures:

REFERENCES

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STUDIA UNIVERSITATIS BABEŞ-BOLYAI, PSYCHOLOGIA-PAEDAGOGIA, LI, 1, 2006

MATHEMATICS SKILLS OF 11-12 YEARS OLD PUPILS

MARCHIŞ IULIANA

ABSTRACT. In this article we study the Mathematics skills of 11-12 years old pupils. We analyze the results of these pupils on a popular Mathematics competition, where more then 10000 5th grade students participate every year. We identify the strong and weak sides of their knowledge, and analyze some frequently appeared error patterns.

1. Introduction

Our society is changing quickly, so the goals in Mathematics teaching changing too. We want our students to understand and use Mathematics in a technological world. They have to learn when to use Mathematics and how to use it. In order to improve the Mathematics teaching, we need to analyze the results of the students – to use diagnostic teaching. Diagnostic teaching involves careful observation. It attempts to determine what individuals are actually learning, the way in which they understand the concepts and how they employ procedures. These observations help the teacher to improve his/her instruction. In this article we analyze the Mathematics skill of the 5th grade pupils, finding the strong and weak sides of their knowledge, analyzing some frequently appeared error patterns.

2. The analyzed data

For this work we had the results of 5th grade students in a very popular Mathematics competition, "Zrínyi Ilona", from 1994 to 2006. This competition is organized every year for 3rd -8th grade students from Hungary, Slovakia, Croatia, Romania, and more than 10000 students from each grade participate. The number of the participating students is increasing, which shows that the competition is popular among pupils. It is not a competition for exceptional skilled students, the pupils participating in this competition has different Mathematics skills. They get 25 problems with different difficulty level and type of skills needed for solving them. For each problems are given five possible results, from which the students have to choose one. We have the data for each problem how many percentage of the pupils have chosen each answer possibility ((A), (B), (C), (D) or (E)). From this data we know how many percentage of the participants got the correct result, but also we can observe, which incorrect answer they have chosen, and identify error patterns in this way.

3. Analyzing skills required for solving different category of problems

We divided the problems in four categories: computation, Mathematical word problems, logical problems and geometry problems. We study the skills required for solving these types of problems and analyze the result of the students.

a) Computation. In this category we have chosen problems, which require computation skills. Pupils have to develop a good foundation in computation in primary school. They have to have a good "number sense", which means they have to count with understanding, they have to develop a sense of natural, whole and rational numbers, represent and use them in flexible way. We study the pupils' computation skills with these numbers. First we have chosen problems where computation with natural numbers needed. One of these problems is:

What is the result of the (150+750+300):75 computation?
(A) 16 (B) 17 (C) 1200 (D) 1275 (E) 1994

The correct answer is (A) and 86% of the pupils have chosen it. Pupils have a good computation skill with natural numbers on this age, for all the questions of this type more than 80% of the pupils gave the right answer. The concept of integers is newer for pupils. They perform less in computations where negative numbers appear. For the following problem only 47% of the pupils got the correct result:

What is the result of $-1\cdot5-(-3)\cdot5-6:2$?
(A) –23 (B) –18 (C) 2 (D) 7 (E) 13

It is interesting to see that 12% of the students have chosen (A), which shows that they have done a typical error: -(-3)= -3, so they have forgotten to change the sign of –3. Analyzing the problems, which require computation with fractions, we clearly observe some error patterns. For example, 65% of the students got the right result for the following problem:

What is the result of $\frac{2}{3}+\frac{3}{2}$?
(A) 1 (B) $\frac{5}{2}$ (C) $\frac{5}{5}$ (D) $\frac{13}{6}$ (E) 5

but 18% of them have chosen (C) , which means that they used the following algorithm for adding fractions: they add the numerators to get the numerator for the sum, then add the denominators to get the denominator for the

sum. This is a typical error for adding fractions; they use the same algorithm as for multiplication (Ashlock, 2002).

The average rate of the correct answers is about 70% in this category, so most of the pupils have good computation skills.

Another interesting problem in computation is to study if students only use the computation algorithms, or if they try to use tricks to be faster in computation. For example in solving the following problem

> What is the sum of the digits in the result of $8 \cdot 50 \cdot 25 \cdot 2 \cdot 125 \cdot 4$?
> (A) 1 (B) 5 (C) 6 (D) 7 (E) 11

we can multiply 8 by 50, then multiply the result with 25, etc, but it is much faster if we multiply $50 \cdot 2 = 100$, $25 \cdot 4 = 100$, $8 \cdot 125 = 1000$, so the answer to the problem is 1. To find out if students use this kind of tricks in computation would be necessary to discuss with them how they solved some concrete problems. Because using computation tricks we get faster the result, another way of studying if pupils use this kind of tricks is to give them a lot of computation problems for a short time and analyze their results. Students who solve more problems possible use computation tricks. Then we can discuss with these selected students to find out what kind of tricks they have used. As written in (NCTM, 2000), "part of being able to compute fluently means making smart choices about which tools to use and when".

b) Mathematical word problems. We can describe these problems in the following way: the problem describes a situation involving numerical relationships; the situation and relationships must first be interpreted and grasped, then arithmetic computations or algebra is needed to get the answer. For example see the following problem:

> In a school there are 600 students, 30 in each class. Each student has 5 lessons per day and each teacher has 4 lessons per day. How many teachers are in the school?
> (A) 20 (B) 24 (C) 25 (D) 30 (E) 32

Solving this problem requires only simple computations with natural numbers: Because there are 600 students in the school and 30 in each class, there are $600 : 30 = 20$ classes in the school. Each class has 5 lessons per day, so there are $20 \cdot 5 = 100$ lessons per day in the school. As every teacher has 4 lessons per day, there are $100 : 4 = 25$ teachers in the school. So only two divisions and a multiplication required for solving this problem. But only the 22% of the students got the correct answer! These problems require more than computation. A good problem solver is characterized by carefulness and step-by-step approach, as

described in (Whimbey, Lochhead, 1999). An important step in solving these problems is to restate the ideas in the own words of the solver, which helps in understanding the problem and in thinking about the solving method. The most difficult step is to rewrite the problem with mathematical notions, operations or equations. If someone can do this step then the probability that he/she solves the problem is very big.

An average percentage of those who get the correct answer in this category is about 25%.

c) Geometry problems. Students perform much less in geometry problems; the average rate of the correct answers is about 20%. Most of the students have difficulties to see in space, to imagine the geometric shape. Analyzing the answers of the students for the following problem:

Stick a cube to every side of a cube. How many times is bigger the surface of the new geometric shape than the surface of the original cube? (A) 4 times (B) 5 times (C) 6 times (D) 20 times (E) 30 times

also leads to the same conclusion. Only 15% of the students got the correct result. It is interesting to see, that 43% of the pupils have chosen the answer (C), because they thought that adding six cubes the surface is six times bigger, they didn't considered the stuck sides.

The results of the students shows, that there is needed more practice in Geometry problems: "As students sort, build, draw, model, trace, measure, and construct, their capacity to visualize geometric relationships will develop." (NCTM, 2000) But for a 5^{th} grade student Geometry is a new subject, this is one of the explications of the bad results.

d) Logical problems. In this category we selected problems, where logical arguing is needed. In average 40% of the students have chosen the correct answer. One of the reasons for unsuccessfulness in solving logical problems is the inaccuracy in reading the text of the problem. Pupils read the material too rapidly, missing one or more words or ideas. Another reason is that a lot of teacher put accent on the procedural learning. Analyze the results of the students in solving the following problem:

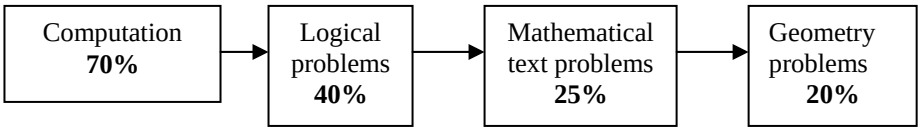
On the clothes of James there are white, black and red spots: with the exception of two all are white, with the exception of two all are red and with the exception of two all are black. How many spots are on his clothes?

(A) 2 (B) 3 (C) 6 (D) 7 (E) there are not enough data to find the result

Only 11% of the pupils got the correct answer to this problem, and 53% of them thought that there are not enough data to find the result.

4. Conclusions

Analyzing the results of the students for different type of problems, we observe that computation problems are the easiest for this age category; almost 70% of the students solve this kind of problems correctly. Logical problems are more difficult, only 40% of the students can solve them. The most difficult problems are the Mathematical text problems and Geometry problems, 20-25% of the pupils are successful in solving them.



This shows that we have to put more accents on this kind of problems and change the teaching methods. We have to put more accents on conceptual learning, than on procedural learning. Conceptual learning in Mathematics focuses on ideas and on generalizations that make connections among ideas. Procedural learning focuses on skills and step-by-step algorithms. Both are necessary, but we use more frequently the procedural learning, trying to give to students algorithms of solving different type of problems instead of teaching them to find their own algorithms. We have to teach the students to think, that is the most important in Mathematics education (Gravemeijer, 1994).

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UNTERSCHIEDENER UNTERRICHT – DIDAKTISCHE TÄTIGKEIT MIT LEISTUNGSFÄHIGEN SCHÜLERN

ADRIENNE KOZAN NAUMESCU, CRISTINA CORPODEAN

ABSTRACT. The present paper presents some aspects regarding teaching the pre-university students, capable of special performances in chemistry.

The activity of performance is approached from three different points of view: student, tacher and family.

The structure of a special curriculum for chemistry is also being presented, curriculum which guides the activity of students preparation at the Local Excellence Centre- Cluj.

Einleitung

In der jetzigen Etappe bekommt die Unterrichtsreform in unserem Land besondere Werte; vergessen wir nicht, dass der ganze edukative, bildende Vorgang das wirtschaftliche und soziale Leben des Landes stark beeinflüsst.

Die Reform wird „von unten nach oben“ vollbracht werden, sie ist die Reform des didaktischen Personals in dem voruniversitären und universitären Unterricht.

Es gibt viele Programme,und zwar die Mehrheit, davon beziehen sich auf Kinder mit besonderen Bedürfnissen: solche die physisch oder geistig behindert, schwer krank, aus unorganisierten Familien stammen, andere die Weisenkinder sind, aber keine, die die überbegabten Kinder, die Leistungsfähigen, die Teilnehmer an den Leistungskursen vor Augen haben.

Haben diese keine besonderen Bedürfnisse? Würde eine psychologische Beratung nicht erforderlich sein; sollte ihre professionelle Ausbildung nicht von einer emotionellen, afektiven gedoppelt werden?

Der Kontakt zu den überbegabten Kindern hat bewiesen, dass diese oft viel Verständniss benötigen, weil sie auch besondere Bedürfnisse haben: sie besitzen ein sehr stark entwickeltes Ego, 70% von ihnen sind intravertiert, von ihren Mitschülern als „Freaks“ bezeichnet, beweisen Anpassungsschwierigkeiten, sie erklären sich selber für „unverstanden“. Die Teilnahme an einem Wettbewerb entwickelt eine selbstsüchtige Seite ihres Charakters, und übertreibt ihren Wunsch nach Perfektion.

Die Leistungsarbeit muss aus folgenden Gesichtspunkten angegangen werden:

A – dem Gesichtspunkt des Schülers
B – der Perspektive des Lehrers
C – dem Gesichtspunkt der Familie

A. Aus einem Fragebogen, der von einer Versuchgruppe von Schulern ausgefullt wurde, kann man folgende Situation entnehmen:

- Was hat dich dazu geführt, am Leistungskurs teilzunehmen?
  - Das Interesse für das Fach 20%
  - Der Wunsch nach Leistung in dem Fach 27%
  - Die praktische Tätigkeit in einem gut ausgerüsteten Labor 45%
  - Tätigkeit als Hobby angesehen 8%
  - Von einem Erwachsenen beeinflüsst (Lehrer oder Eltern) 0%
- Was erwartest du von den Tätigkeiten in den Leistungsgruppen?
  - Die Erweiterung der theoretischen Kenntnisse in dem bestimmten Bereich 27%
  - Interessante Labor-Tätigkeiten 63%
  - Schwierige Aufgaben lösen 10%
- Wie viele Extra-Stunden bist du bereit wöchentlich dem Leistungsprogramm zu widmen?
  - Nur für die Dauer der Tätigkeit 25%
  - Durchschnittlich 1 Std./Tag 45%
  - Mehr als 1 Std./Tag 30%

Die Erfahrung dieser Art von Tätigkeit hat im Laufe der Zeit bewiesen (amtlich geht es seit 5 Stunden vor), dass nach den ersten Sitzungen (2 bis 3) ein Durchschnitt von 20 bis 30% der Schüler aufgeben, aus den folgenden Gründen:

- Sie werden von den Kenntnissen der anderen Teilnehmer eingeschüchtert
- Sie werden von der Komplexität und Überfluss der Kenntnisse eingedrängt
- Sie werden von dem Schwierigkeitsgrad der Aufgaben übertroffen
- Sie fühlen, die Tätigkeiten entsprechen nicht ihren Erwartungen (zu viele theoretische Kenntnisse und zu wenige praktische Tätigkeiten)

Später geben noch 10% der Schüler auf, wegen des überlaufenden Stundenplans, und wegen Überforderung an zu vielen Tätigkeiten. Nach den Schulwettbewerben geben noch 10% auf, weil sie sich nicht für die oberen Etappen qualifiziert haben. Dieses Phänomen taucht vor allem bei den Anfagerklassen auf (die VII., IX.) und bei der VIII. Klasse, bei der letzten wegen der Endprüfungen und des überlaufenden Stundenplans.

Die Schlussfolgerung kann zeigen, dass das Aufgeben aus folgenden Gründen auftaucht:

- Ein zu uberfullter stundenplan
- Der Vergleich, der Bezug zu den anderen Schülern, die weiteren und tieferen Kenntnisse haben
- Das Versagen bei einem Schulwettbewerb, das den Schülern das Gefühl der Unnützlichkeit ihrer Arbeit gibt
- Der hohe Schwierigkeitsgrad der Aufgaben bei den Schulwettbewerben

- Die hohe Erwartungen der Schüler, die Chemie, Physik, Biologie für experimentelle Wissenschaften halten, und glauben, die Stunden sollten nur aus experimentellen Tätigkeiten bestehen, ohne die Vervollständigung der theoretischen Kenntnissen und Aufgabenlösungen
- Die Schüler-Lehrer Unverträglichkeit

B. Aus dem Gesichtspunkt des Lehrers, sollte dieser eine weite informationelle Packung besitzen, auf dem Laufenden in dem Wissenschaftlichem Bereich sein, die Erfahrung der Schulwettbewerben haben, ein guter Methodist sein, ein gewidmeter Lehrer sein, und nur seiner Arbeit treu sein.

Die menschlichen Ressourcen, mit denen der Lehrer arbeitet, müssen hohe intellektuelle Fähigkeiten haben, die intellektuellen Bestandteile (den Kenntnissübergang, die Synthesisfähigkeit, die Vertieferungsfähigkeit) sehr gut entwickelt haben, und innerlich motiviert sein.

Der Lehrer muss ein menschliches Material bearbeiten, das an das Studium interessiert ist, das bereit ist, dem Studium, der Aufgabenlösung und der Labor-Tätigkeit Zeit zu widmen, indem es seine Freizeit und, am öftesten in der Leistungstätigkeit, andere Fächer vernachlässigt.

Wir halten eine Chemie-Mathematik-Physik-Biologie fächerübergreifende Annäherung für nötig, um den Horizont der Schüler zu erweitern, um ihnen die Bestimmung der Phänomene zu demonstrieren, um die Beziehungen zwischen den Begriffen und Konzepten zu beweisen, um sie für die Forschungstätigkeit vorzubereiten und um sowohl ihre Perspektive über die heutigen Fächer (Biophysik, Biochemie) zu öffnen, als auch das Abhängigkeitsverhältnis im Rahmen einer älteren (Chemie-Physik).

Die Teamarbeit der Lehrer ist nötig: Mathematik (um den mathematischen Bedienungshintergrund zu sichern), Physik-Chemie-Biologie, und andere Lehrer (mindestens 2) in demselben Fach, während eines Studiumjahres, damit sie sich gegenseitig ergänzen können, und bestimmte theoretische Kenntnisse aus mindestens zwei verschiedenen Perspektive angehen können.

Der Lehrer muss bereit sein, ein Stück seiner persönlichen Freizeit den Stunden zu schenken, die viel Zeit und eine besondere Anstrengung verlangen, wegen der Komplexität der Kenntnisse und der tatsächlichen Intensität mit der die Stunden ablaufen; das menschliche Material ist interessiert, motiviert, mit einer reichen informationellen Packung und mit hohem Intelligenzquotienten, aber mit geringer emotionellen Intelligenz, was ein Hindernis in der Beziehungsfähigkeit ist. Die vier Wochenstunden der Vobereitung mit der Leistungsgruppe können, in dem, was Astrengung und Erleben heisst, mit einer Woche Klassenarbeit verglichen werden, aber die Erfüllung ist viel größer.

Die Begabung eines Lehrers in dem wissenschaftlichen Bereich besteht aus der „Entdeckung der Spitzen“ in den jungen Klassen (VII., VIII.), deren affektiv-motiviationellen Aufmunterung, deren Integrierung in einem besonderen Programm für überbegabte Schüler.

Der Chemielehrer wird sich in der Klasse wie „eine Feder“ verhalten, in dem er seine sowohl affektive als auch kognitive Biegsamkeit jeden Moment beweisen wird.

In diesem Sinne, wird ein „guter“ Lehrer in dem voruniversitären Unterrichtswesen beweisen, dass er über allgemeine und spezifische chemische Fähigkeiten verfügt: Fachepistemologie, allgemeine und didaktische Epistemologie, Klassenverwaltung. Es ist eine wahre „Kunst“, während des Chemieunterrichts die frontale Tätigkeit mit der ganzen Klasse mit der unterschiedenen zu kombinieren, die für die leistungsfähigen Schüler gedacht ist.

C. Aus dem Gesichtspunkt der Familie, werden diese in drei eingeteilt:

a) Gleichgültig

b) Diejenigen, die engagiert sind, und die Arbeit und Anstrengung der Kinder durch Photokopien, durch das Besorgen von Fachbüchern und das Entschuldigen von anderen Tätigkeiten unterstützen.

c) Diejenigen, die dagegen sind, wegen des überlaufenden Stundenplans der Kinder und deren zuschüssigen Anstrengung, weil sie glauben, dass diese ihrer physischen und psychischen Gesundheit gefährdet.

Die Erfahrung hat bewiesen, dass die b) Situationen am häufigsten zu treffen und zu wünschen sind.

Die Ergebnisse der Schüler in den rumänischen Schulen bei den nationalen und internationalen Wettbewerben sind in diesem Sinn besonders bedeutsam. Das führt uns zu der Behauptung, dass zumindest aus dem Gesichtspunkt unserer Schule, ist Rumäniens Anschluss an die E.U. eine Sicherheit.

STUDIENVERZEICHNISPROJEKT

1. ATOMSTRUKTUR

1.1 ***Quantennummern***.- Definition, Symbol, Wertetabelle welche die Korespondenz zwischen Werte der Quantennummern und der Anzahl der Schalen, Unterschalen, Orbitale wiederspiegeln soll.

1.2 ***Elektronenkonfigurationen.- fur Atome (verschiedene Darstellungs*** Methoden, Abweichungen von der Regel (VI B, I B, Lanthanide, Aktinide)

- fur Ionen: mit den Konfigurationen eines Edelgases, Halbstrukturen, andere Konfigurationen. (Verallgemeinungen fur die Metallen der p und d Blocke), die Korespondenz zwischen Elektronenkonfiguration, Stellung in dem Periodensystem, Ionisierung, Anzahl der Verbindungen die sie bilden.

2. **PERIODENSYSTEM**

2.1 Neuentdeckte Elemente

2.2 Veranderung der Eigenschaften in dem Periodensystem

- atomiches Radius, atomisches Volumen, ionisches Radius

- Ionisierungsenergie, metallischer Charakter
- Elektronenafinitat, nichtmetallischer Charakter, Electronegativitat, elektronegatives Charakter.

2.3 ***Veranderungen*** der basischen, saurigen und amphoteren Charakter in den Periodensystem

2.4 ***Berechnung*** der Oxidationszahl in interhalogenen Verbingungen, Sauerstoffsauren**,** Mischoxide der Metalle des p-Blocks.

3. **WASSERSTOFF** (Herstellungsmethoden, chemische Eignschaften). Hydride (Einteilung, Struktur, Hydride mit Elektronenmanger, komplexe Hydride, Anwendungen als Reduktionsagenten)

4. **SAUERTSOFF** (M.O.M, M.L.V, allotrope Formen- Ozon, Hertsellungsmethoden, chemische Eigenschaften). Basische Oxide, saure Oxide, amphotere Oxide, Peroxide.

5. **Die Gruppe der Halogene**. CHLOR BROM. IOD. Die Oxide des Chlors, der Salze und halogene der Salze des Chlors.

- Vergleichung zwischen die Veranderung der Eigenschaften und der metallischer Charakter der Halogene
- Herstellungmethoden des Chlors (Redox, die Feststellung der Koeffizieten duch Redoxmethode)
- Zuordnung der Saureanhydride – oxidierte Sauren – Salze, Stabilitat, Schneiden, Herstellung
- Interhalogene Verbindungen
- Entwicklung der Intuition und des chemischen Verhaltens im Sinne der Festlegung neuer Reaktionsprodukte
- Das Studium der Metalle
- Experimentalles Studium

6. **NICHTMETALLE AUS DER 2. UND 3. PERIODE. VERGLEICHUNG**.

- Kohlenstoff
- Stickstoff (Ammoniak, Oxide, Sauren, Nitrate)
- Fosfor (Oxide, oxidierte Sauren, allotrope Formen)
- Schwefel (Oxide, sauerstoffhaltige Sauren, Vergleichung mit Selenium und seine Verbindungen)

7. **SAUREN**. Die protolytische Theorie, Lewis Sauren. Vergleichungsstudium zwischen HCl, H_2SO_4, HNO_3 .

Der Gleichgewicht Saure-Base, die Saurekonstante, der pH der starken und schwachen Sauren, Gesetz von Ostwald

8. **METALLE**. (physikalische Eigenschaften- graphische Interpretationen, chemische Eigenschaften- Verallgemeinung der Elemente auf den Blocks). Experimentalles Studium (Oxidationsformen, V, Cr, Mn)

9. **BASEN**. Die protolytische Theorie, Lewis Basen. Die Starke der Basen, die basische Konstante, pH) experimentalles Studium- Herstellung von unloslichen Basen, amphotere Charakter

10. **Verhaltnis Ionisierung-Kovalenz** in chemische Verbindungen, Korepsondenz, Ionsisierung- basisches Charakter; Kovalenz- saurer Charakter

11. **Molekule**. Polaritat der Molekule. Geometrie der Molekule. Gesetz von Gillespie. MOM, MLV. (Hybridisierung sp, sp^2, sp^3, sp^3d, sp^3d^2, dsp^3). Interrmolekulare Verbindungen.

12. **Koordinative Verbindung**. Komplexe Bindungen (koordinative Anzahl, Liganden, Hybridisierungen, Geometrie, Nomendatur). Verbindungen mit Verbindungen Metall- Metall. Experimentalles Studium- Herstellung, Eigenschaften der complexe Verbindungen.

13. **Die Konzentration der Losungen** (verhaltisse, molare, normale, Krisallhydrate)

14. **Gasgesetze** (Dichte, d, M, molare Bruche, Teildrucke)

15. **Chemisches Gleichgewicht**. Relation K_c, K_p, K_x, $K\gamma$, Gesetz von Le Chatelier. Experimentalles Studium- Einfluss der Faktoren uber die Verschiebung der chemisches Gleichgewichtes

16. **Arten von Aufgaben**:

Kentnisse zu: γ, $V\mu$, μ, η, C_p, C_T., Reinheit, Konversion.

- Berechnungen, Uberschuss eines Reaktionsmittel, limitatives Komponent
- Molarverhaltnis, Massenverhaltnis,prozentuale zusammensetuzung
- Echimolaren, Echimolekulare, Echimassige Bindungen

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